Nested If Statements Assignment

Overview

This assignment focuses on understanding and implementing nested if statements in Java. Students will work with conditional logic that requires multiple levels of decision-making.

Assignment 1: Leap Year Checker

Learning Objectives

- Understand nested if statement structure
- Practice logical thinking with multiple conditions
- Learn about leap year calculation rules
- Implement proper input/output handling

Understanding Leap Years (and How to Code Them in Java)

What is a Leap Year?

A leap year is a year that has 366 days instead of 365.
That extra day goes to February, which has 29 days instead of 28.

Why?

Because the Earth doesn't orbit the Sun in exactly 365 days — it actually takes about 365 days + 6 hours.
Those 6 hours add up:

After 4 years → ~24 hours → one extra day needed.

So we add it to February to keep our calendars accurate.

Leap Year Rules

A year is a leap year if:

1. It is divisible by 4, AND
2. Either it is NOT divisible by 100, OR it IS divisible by 400

This means:

- Years divisible by 4 are leap years (e.g., 2004, 2020, 2024)
- EXCEPT years divisible by 100 are NOT leap years (e.g., 1900, 1800, 2100)
- EXCEPT years divisible by 400 ARE leap years (e.g., 2000, 1600, 2400)

Requirements

Create a `LeapYearChecker` class that:

1. **Prompts the user** for a year input
2. **Uses nested if statements** to determine if the year is a leap year
3. **Displays the result** in the format: `"YEAR is a leap year."` or `"YEAR is NOT a leap year."`

Test Cases

Your program should correctly handle these test cases:

Leap Years:

- 2000 (divisible by 4, 100, and 400)
- 2004 (divisible by 4, not by 100)
- 2020 (divisible by 4, not by 100)
- 2024 (divisible by 4, not by 100)
- 1600 (divisible by 4, 100, and 400)
- 2400 (divisible by 4, 100, and 400)

Not Leap Years:

- 1900 (divisible by 4 and 100, not by 400)
- 1800 (divisible by 4 and 100, not by 400)
- 2001 (not divisible by 4)
- 2019 (not divisible by 4)
- 2100 (divisible by 4 and 100, not by 400)
- 2200 (divisible by 4 and 100, not by 400)
- 2023 (not divisible by 4)

Sample Output

```
Enter a year: 2000
2000 is a leap year.
```

```
Enter a year: 1900
1900 is NOT a leap year.
```

Assignment 2: Grading System

Learning Objectives

- Practice nested if statements with multiple conditions
- Understand grade ranges and modifiers

- Implement complex conditional logic
- Handle edge cases in grading systems

Grading System Rules

Create a `GradingSystem` class that converts numerical scores (0-100) to letter grades with modifiers:

Letter Grade Ranges:

- **A**: 90-100
- **B**: 80-89
- **C**: 70-79
- **D**: 60-69
- **F**: Below 60

Modifier Rules:

Within each grade band:

- **Top 2 points** → Add "+" (e.g., 98-100 = A+, 88-89 = B+)
- **Bottom 4 points** → Add "-" (e.g., 90-93 = A-, 80-83 = B(-))
- **Middle range** → Plain letter (e.g., 94-97 = A, 84-87 = B)
- **F grade** → No modifiers (always just "F")

Examples:

- 100 → A+
- 99 → A+
- 98 → A+
- 97 → A
- 96 → A
- 95 → A
- 94 → A
- 93 → A-
- 92 → A-
- 91 → A-
- 90 → A-
- 89 → B+
- 88 → B+
- 87 → B
- 86 → B
- 85 → B
- 84 → B
- 83 → B-
- 82 → B-
- 81 → B-
- 80 → B-

- 79 → C+
- 78 → C+
- 77 → C
- 76 → C
- 75 → C
- 74 → C
- 73 → C-
- 72 → C-
- 71 → C-
- 70 → C-
- 69 → D+
- 68 → D+
- 67 → D
- 66 → D
- 65 → D
- 64 → D
- 63 → D-
- 62 → D-
- 61 → D-
- 60 → D-
- 59 → F
- 0 → F

Requirements

Create a `GradingSystem` class that:

1. **Prompts the user** for a score (0-100)
2. **Uses nested if statements** to determine the letter grade and modifier
3. **Displays the result** in the format: `"The grade is: GRADE"`

Implementation Guidelines

Test Cases

Your program should correctly handle these test cases:

A Grades:

- 100, 99, 98 → A+
- 97, 96, 95, 94 → A
- 93, 92, 91, 90 → A-

B Grades:

- 89, 88 → B+
- 87, 86, 85, 84 → B
- 83, 82, 81, 80 → B-

C Grades:

- 79, 78 → C+
- 77, 76, 75, 74 → C
- 73, 72, 71, 70 → C-

D Grades:

- 69, 68 → D+
- 67, 66, 65, 64 → D
- 63, 62, 61, 60 → D-

F Grades:

- 59, 50, 0 → F (no modifiers)

Sample Output

```
Enter a score (0–100): 98
The grade is: A+

Enter a score (0–100): 95
The grade is: A

Enter a score (0–100): 92
The grade is: A–

Enter a score (0–100): 88
The grade is: B+

Enter a score (0–100): 85
The grade is: B

Enter a score (0–100): 82
The grade is: B–

Enter a score (0–100): 78
The grade is: C+

Enter a score (0–100): 75
The grade is: C

Enter a score (0–100): 72
The grade is: C–

Enter a score (0–100): 68
The grade is: D+

Enter a score (0–100): 65
The grade is: D
```

```
Enter a score (0–100): 62
The grade is: D-

Enter a score (0–100): 59
The grade is: F
```