Project Exam #0 - 1

Detecting Numbers Divisible by 9

Objective:

This project aims to design and implement a program that checks if a number is divisible by 9 using the MIPS Assembly Language. You will use the MARS simulator to write, assemble, and run your code. The program will determine if a given number is divisible by 9 based on whether the sum of its digits is a multiple of 9 and will print an appropriate message.

Divisibility by 9 Rule:

A number is divisible by 9 if the sum of its digits is also divisible by 9. For example:

- **Divisible by 9:** 81 (sum of digits: 8 + 1 = 9), 729 (sum of digits: 7 + 2 + 9 = 18)
- **Not divisible by 9:** 123 (sum of digits: 1 + 2 + 3 = 6)

Project Requirements:

1. **Input:**
   - The program should prompt the user to enter an integer.
2. **Process:**
   - The program will calculate the sum of the digits of the entered number.
   - It will check if the sum of the digits is divisible by 9.
3. **Output:**
   - If the sum of the digits is divisible by 9, print: "The number is divisible by 9."
   - If the sum is not divisible by 9, print: "The number is NOT divisible by 9."

Example:

- **Input:** 729 **Output:** "The number is divisible by 9."
- **Input:** 123 **Output:** "The number is NOT divisible by 9."

Design Outline:

1. **Input the Number:**
   - Use a MIPS syscall instruction to prompt and take user input for a number.
2. **Calculate the Sum of Digits:**
   - Extract each digit of the number using modulo (`%`) and division (`/`) operations.
   - Accumulate the sum of the digits.
3. **Check Divisibility:**
   - Determine if the sum of the digits is divisible by 9 by checking for a zero remainder.
4. **Output the Result:**
   - Use a syscall to display the appropriate message.

How to Verify Your Design Using MARS Simulator:

1. **Write the Program:**
   - Open MARS and write your MIPS assembly code using the project outline provided.
2. **Assemble the Program:**
   - Click the Assemble button in MARS to check for any syntax errors in your code.
3. **Run the Program:**
   - After assembling successfully, click Run. The program will prompt for input, and based on your logic, it will display whether the number is divisible by 9 or not.
4. **Test Cases:**
   - Test your program with different inputs (both divisible and not divisible by 9) to verify its correctness.

Hints for the Project:

- You can use MIPS pseudo-instructions to simplify your coding (e.g., `move`, `li`).
- Use syscalls for input/output operations in MIPS.
- Don’t forget to handle both single-digit and multi-digit numbers correctly.