Java While Loop Assignment: Understanding Iteration

This assignment will test your understanding of Video 2.1. Skills from previous units will also be used to complete and understand problem solutions.

Part 1: Output Prediction - Loop Analysis

Objective: Analyze the given Java code snippets and predict their exact output.

Instructions:

For each code snippet below, write down what you expect to be printed to the console. Pay close attention to loop conditions, variable increments/decrements, and conditional statements.

Snippet A:

```java
package org.firstinspires.ftc.teamcode;

public class LoopPredictorA {
    public static void main(String[] args) {
        int count = 0;
        while (count < 5) {
            System.out.println("Current count: " + count);
            count++;
        }
        System.out.println("Loop finished. Final count: " + count);
    }
}
```

Predicted Output for Snippet A:

<!-- Your prediction here →
0
1

2
3
4
Loop Finished. Final count: 4

Snippet B:

```java
package org.firstinspires.ftc.teamcode;

public class LoopPredictorB {
    public static void main(String[] args) {
        int x = 10;
        while (x > 0) {
            if (x % 2 == 0) {
                System.out.println("Even: " + x);
            } else {
                System.out.println("Odd: " + x);
            }
            x -= 3;
        }
        System.out.println("End of B");
    }
}
```

Predicted Output for Snippet B:

<!-- Your prediction here >

Even: 10

End of B

Snippet C:

```java
package org.firstinspires.ftc.teamcode;

public class LoopPredictorC {
    public static void main(String[] args) {
        int i = 1;
        int sum = 0;
        while (i <= 5) {
            sum += i;
            i++;
            if (sum > 10) {
                System.out.println("Sum exceeded 10. Current sum: " + sum);
            }
        }
        System.out.println("Total sum: " + sum);
    }
}
```

Predicted Output for Snippet C:

<!-- Your prediction here >
Total sum: 5

Part 2: Code Creation - The Guessing Game

Objective: Write a Java program that implements a simple number guessing game using a `while` loop.

Instructions:

1. Create a new Java class named `GuessingGame`.

2. The program should generate a random number between 1 and 100 (inclusive).
    - *Hint:* You can generate a random number using `(int)(Math.random() * 100) + 1;`
3. Prompt the user to guess the number.
4. Use a `while` loop to continue prompting the user for guesses until they guess the correct number.
5. Inside the loop:
    - Read the user's guess.
    - If the guess is too high, print "Too high! Try again."
    - If the guess is too low, print "Too low! Try again."
    - If the guess is correct, print "Congratulations! You guessed the number in [number of attempts] attempts."
6. Keep track of the number of attempts the user makes.
7. Ensure your code includes clear comments explaining each section.

Example Output window:

Welcome to the Guessing Game!
I have picked a number between 1 and 100.
Enter your guess: 50
Too high! Try again.
Enter your guess: 25
Too low! Try again.
Enter your guess: 37
Too high! Try again.
Enter your guess: 31
Congratulations! You guessed the number in 4 attempts.

```java
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        // Create Scanner object for user input
        Scanner scanner = new Scanner(System.in);

        // Generate a random number between 1 and 100 (inclusive)
        int targetNumber = (int)(Math.random() * 100) + 1;

        // Initialize variables
        int userGuess = 0;           // Store user's guess
        int attempts = 0;            // Count number of attempts
        boolean hasGuessedCorrectly = false; // Flag to control the loop

        // Display game introduction
        System.out.println("=== Number Guessing Game ===");
        System.out.println("I have generated a random number between 1 and 100.");
        System.out.println("Can you guess what it is?");
        System.out.println();

        // Main game loop - continue until user guesses correctly
        while (!hasGuessedCorrectly) {
            // Prompt user for their guess
            System.out.print("Enter your guess: ");
            userGuess = scanner.nextInt();

            //increase attempt counter
            attempts++;

            // Check if guess is correct, too high, or too low
            if (userGuess == targetNumber) {
                // Correct guess - end the game
                hasGuessedCorrectly = true;
                System.out.println("Congratulations! You guessed the number in " + attempts + " attempts.");
            } else if (userGuess > targetNumber) {
                // Guess is too high
                System.out.println("Too high! Try again.");
            } else {
                // Guess is too low
                System.out.println("Too low! Try again.");
            }

            System.out.println(); // Add blank line for better readability
        }

        // Thank the user and close scanner
        System.out.println("Thanks for playing!");
        scanner.close();
    }
}
```

// **Screenshot code and place here.**

Part 3: Debugging - Fixing the Infinite Loop

Objective: Identify and correct the error(s) in the provided Java code to make it function as intended.

Problem Description: The following code is supposed to print numbers from 1 to 5, but it runs into an infinite loop. Your task is to fix the code so it correctly prints "1", "2", "3", "4", "5"

```java
package org.firstinspires.ftc.teamcode;

public class InfiniteLoopFix {
    public static void main(String[] args) {
        int num = 1;
        while (num <= 5) {
            System.out.println(num);
        }
        System.out.println("Loop complete!");
    }
}
```

each on a new line, and then "Loop complete!".

Original Code (with error):

Instructions:

1. Copy the `Original Code` into your IDE.
2. Identify the reason for the infinite loop.
3. Modify the code to fix the issue.
4. Add a comment explaining the fix you implemented.

Corrected Code:

// **Screenshot corrected code and paste here**

```java
package org.firstinspires.ftc.teamcode;

public class InfiniteLoopFix {
  public static void main(String[] args) {
      int num = 1;
    while (num <= 5) {
      System.out.println(num);
      num++; //without this line, the loop will never end
    }
    system.out.println("Loop Complete");
  }
}
```