LAB ASSIGNMENT – 1

Program

```
import java.util.Scanner;


public class FibonacciStepCount {

    // Step counter for recursion
    static int stepRec;

    // Recursive method
    public static int fibRecursive(int n) {
        stepRec++;
        if (n <= 1) return n;
        return fibRecursive(n - 1) + fibRecursive(n - 2);
    }

    // Iterative method
    public static int fibIterative(int n) {
        int a = 0, b = 1;
        int stepItr = 0;
        for (int i = 0; i < n; i++) {
            stepItr++;
            int temp = a;
            a = b;
            b = temp + b;
        }
        System.out.println("Iterative Fibonacci of " + n + " = " + a);
        System.out.println("Steps (Iterative): " + stepItr);
        return a;
    }

    // Dynamic programming (bottom-up) method
    public static int fibDP(int n) {
        if (n <= 1) {
            System.out.println("DP Fibonacci of " + n + " = " + n);
            System.out.println("Steps (DP): 0");
            return n;
        }

        int[] fib = new int[n + 1];
        fib[0] = 0;
        fib[1] = 1;

        int stepDP = 0;
        for (int i = 2; i <= n; i++) {
            stepDP++;
            fib[i] = fib[i - 1] + fib[i - 2];
        }
```

```
        System.out.println("DP Fibonacci of " + n + " = " + fib[n]);
        System.out.println("Steps (DP): " + stepDP);
        return fib[n];
    }

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter N : ");
        int n = sc.nextInt();

        System.out.println("\n--- Recursive Method ---");
        stepRec = 0;
        int recResult = fibRecursive(n);
        System.out.println("Recursive Fibonacci of " + n + " = " + recResult);
        System.out.println("Steps (Recursive): " + stepRec);

        System.out.println("\n--- Iterative Method ---");
        int itrResult = fibIterative(n);

        System.out.println("\n--- Dynamic Programming Method ---");
        int dpResult = fibDP(n);
    }
}
```

Output

```
"C:\Program Files\Java\jdk-24\bin\java.exe" "-
Enter N : 30

--- Recursive Method ---
Recursive Fibonacci of 30 = 832040
Steps (Recursive): 2692537

--- Iterative Method ---
Iterative Fibonacci of 30 = 832040
Steps (Iterative): 30

--- Dynamic Programming (Bottom-Up) Method ---
DP Fibonacci of 30 = 832040
Steps (DP): 29

Process finished with exit code 0
```

Fig – Comparing Step Count for N^{th} Fibonacci Number Calculation.