Problem Statement:

Generate a recursive algorithm for creating the series of Fibonacci numbers up to a givennumber of elements. The number of elements should be read from a file fibonacci.txt. Your task is to implement the code of your algorithm and then find out the total number of steps. Finally compare the number of steps (i.e., at least 10 comparisons) with an algorithm which do not use recursive method forgenerating the Fibonacci numbers (include graphs if required).

Details Description and Algorithm:

Fibonacci series is just like : 0,1,1,2,3,5,8,13…….

Here I implement and compare two algorithm which create the series and count the number of step needed.

First Algorithm:

```
Fibo_Function(A,n) // A is an arry of size n
{
If(n<=2) then
{
If(n=1) then a[1]:=0;
else a[1]:=0;a[2]:=0;
}
else
{
for i:=3 to n do
a[i]:=a[i-1]+a[i-2];
```

```
}
}
```

Second Algorithm:

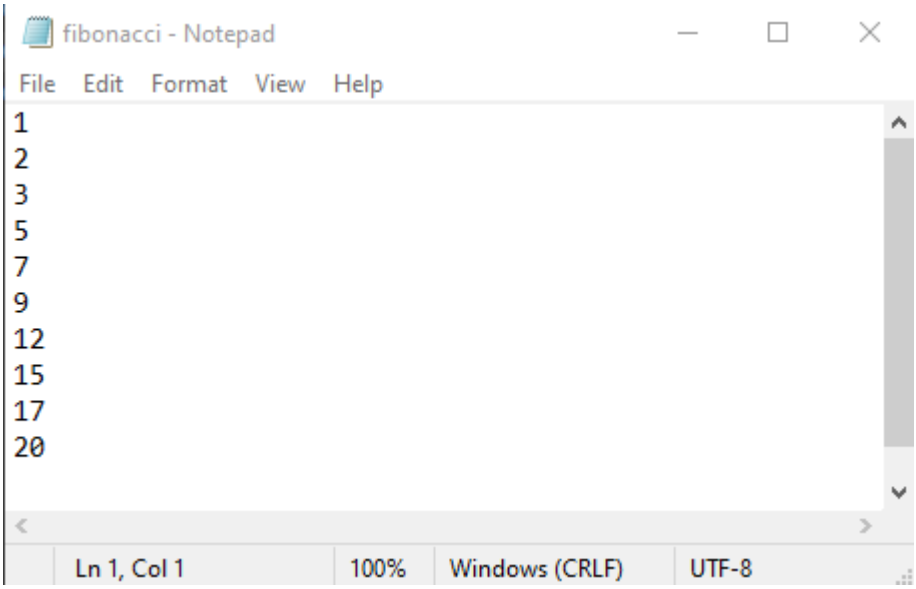
```
Fibo_Function(n) // n is the nth Fibonacci number of the series
{
If(n<=1) then return n;
return Fibo_Function(n-1)+ Fibo_Function(n-2);
}
```

Implemented Code(by Algorithm-1):

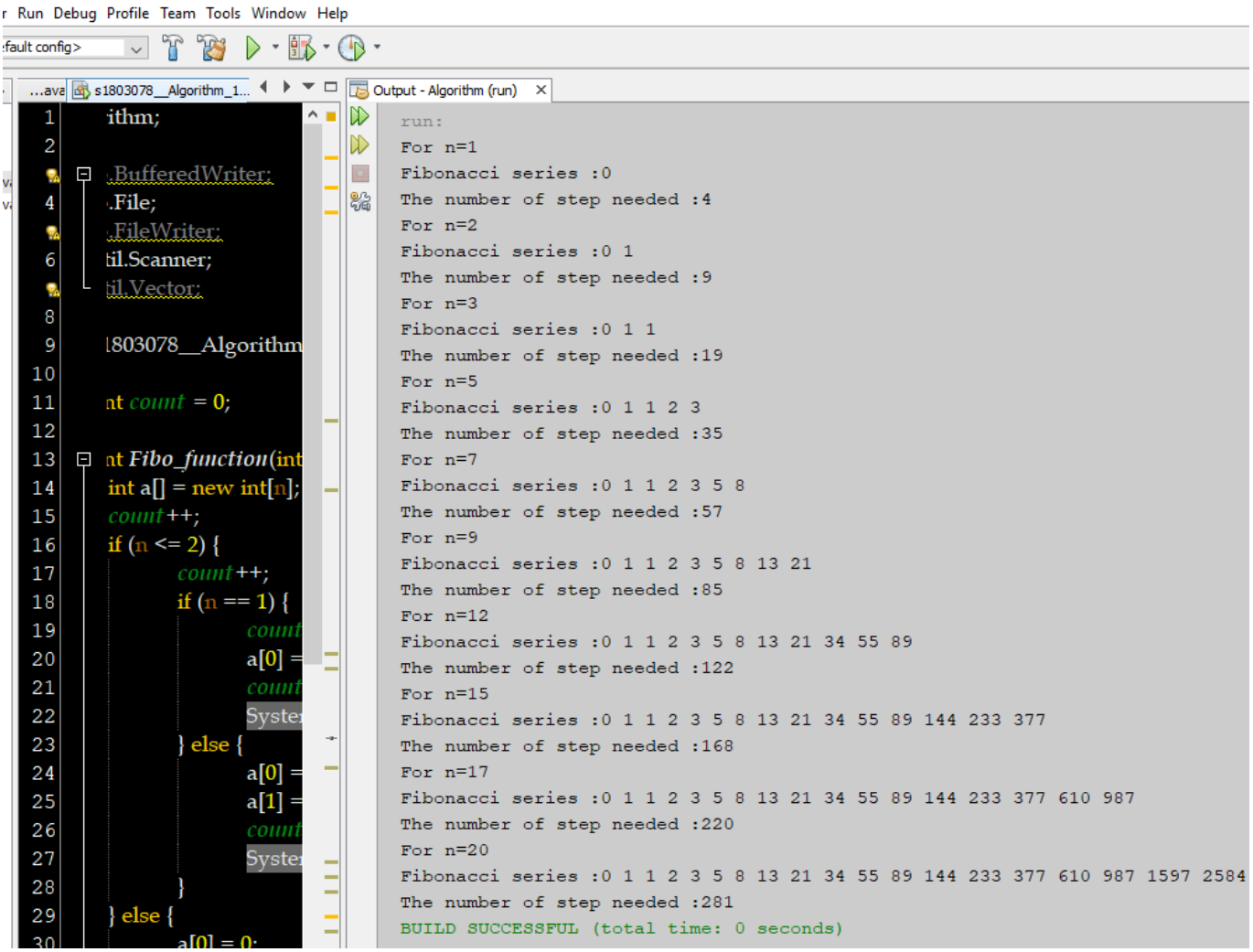
```
package algorithm;

import java.io.BufferedWriter;
import java.io.File;
import java.io.FileWriter;
import java.util.Scanner;
import java.util.Vector;

public class s1803078__Algorithm_1 {

   static int count = 0;

   static int Fibo_function(int n) {
      int a[] = new int[n];
      count++;
      if (n <= 2) {
         count++;
         if (n == 1) {
            count++;
            a[0] = 0;
            count++;
            System.out.print("Fibonacci series :"+a[0]);
         } else {

            a[0] = 0;
            a[1] = 1;
            count += 3;
            System.out.print("Fibonacci series :"+a[0]+" "+a[1]);
         }
      } else {
         a[0] = 0;
         a[1] = 1;
         count += 3;
         for (int i = 2; i < n; i++) {
            count++;
            a[i]=a[i-1]+a[i-2];
            count++;
         }
         count++;
         System.out.print("Fibonacci series :");
         for(int i=0;i<n;i++){System.out.print(a[i]+" ");}
         count+=n;
```

```
        }
        return count;
    }

    public static void main(String[] args) {
        Scanner ob = new Scanner(System.in);

        try {
            File f = new File("fibonacci.txt");
            Scanner ob1 = new Scanner(f);
            while (ob1.hasNext()) {
                int n = Integer.valueOf(ob1.next());
                System.out.println("For n=" + n);
                System.out.println("\nThe number of step needed :" + Fibo_function(n));
                System.out.println();

            }
        } catch (Exception e) {
            System.out.println(" Exception found");
        }
    }
}
```

File (fibonacci.txt):



Sample Input and Output:



Implemented Code(by Algorithm-2):

```
package algorithm;

import java.io.File;
import java.util.Scanner;

public class s1803078__Algorithm_2 {

   static long count = 0;

   public static long fibo_function(long n) {
      if (n <= 1) {
         count++;
         return n;
      }
      count+=3;
      return fibo_function(n - 2) + fibo_function(n - 1);
   }

   public static void main(String args[]) {

      try {
         File f = new File("fibonacci.txt");
         Scanner ob = new Scanner(f);
         while (ob.hasNext()) {
            String s = ob.nextLine();
            long n = Long.valueOf(s);
            System.out.print("For n=" + n + "\nFibonacci series :");
            for (int i = 0; i < n; i++) {
               System.out.print( fibo_function(i) + " ");
            }
            //System.out.println();
            System.out.println("\nNumber of step :"+count);
         }
      } catch (Exception e) {
         System.out.println("Mariya Amin Jumi is the main Exception . Solve that real
problem .");
      }

   }
}
```

File (fibonacci.txt):

fibonacci - Notepad

File Edit Format View Help

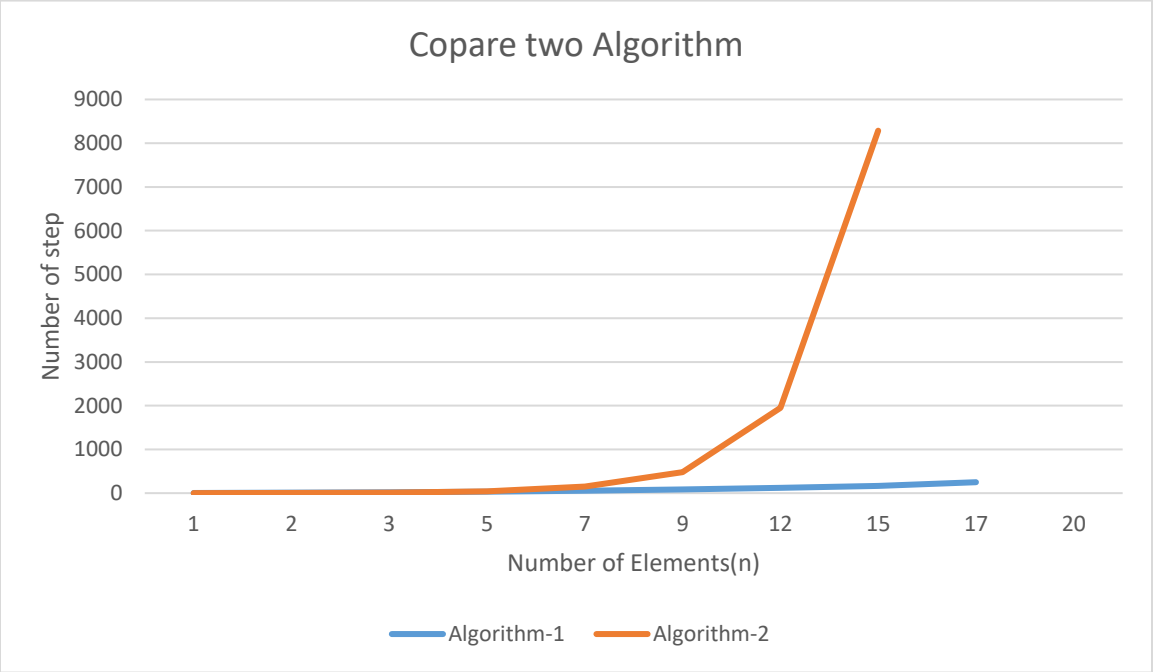
```
1
2
3
5
7
9
12
15
17
20
```

Ln 1, Col 1 | 100% | Windows (CRLF) | UTF-8

Sample Input and Output:

```
run:
For n=1
Fibonacci series :0
Number of step :1
For n=2
Fibonacci series :0 1
Number of step :3
For n=3
Fibonacci series :0 1 1
Number of step :10
For n=5
Fibonacci series :0 1 1 2 3
Number of step :43
For n=7
Fibonacci series :0 1 1 2 3 5 8
Number of step :154
For n=9
Fibonacci series :0 1 1 2 3 5 8 13 21
Number of step :479
For n=12
Fibonacci series :0 1 1 2 3 5 8 13 21 34 55 89
Number of step :1947
For n=15
Fibonacci series :0 1 1 2 3 5 8 13 21 34 55 89 144 233 377
Number of step :8286
For n=17
Fibonacci series :0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987
Number of step :24955
For n=20
Fibonacci series :0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987 1597 2584 4181
Number of step :95735
BUILD SUCCESSFUL (total time: 0 seconds)
```

Comparing Input Output by Graph :



Discussion and Conclusion:

By comparing these two Algorithm, we see Algorithm-2 takes more step than Algorithm-1. That's why ,Algorithm-1 is better than Algorithm-2.