Algorithms and Data Structures

Assignment 1: Recursion

1. Write and test a recursive function that returns the sum of the squares of the first n positive integers.

   $1^2 + 2^2 + \ldots + n^2$

   Sample Input: n = 4

   Sample Output: $1^2 + 2^2 + 3^2 + 4^2 = 30$

2. Write a recursive function to calculate the nth term of the Fibonacci sequence.
3. Write and test a recursive function that returns the sum of the first n elements of an array.
4. Write a recursive method to compute the sum of the first n positive integers.
5. Write and test a recursive function that returns the sum of the first n powers of a base b.

   $b^0 + b^1 + b^2 + \ldots + b^n$

   Sample Input: b = 4, n = 3

   Sample Output: $4^0 + 4^1 + 4^2 + 4^3 = 85$

6. Write a recursive function to find the maximum value in an array.
7. Write a recursive function to find the greatest common divisor (GCD) of two numbers.
8. Given a positive integer N and a sequence of N elements. You have to display given sequence in reverse order.

   Note. The program is forbidden to declare arrays, and use the cycles (even for input).

   Sample Input: 3

   1 2 3

   Sample Output: 3 2 1

9. Given a positive integer N and a sequence of N strings. You have to display given sequence in reverse order.

   Note. The program is forbidden to declare arrays (only one char array in function is allowed), and use the cycles (even for input).

   Input: First line contains n (1<=n<=100). The next n lines contain one-dimension char arrays. Array is no longer that 20 symbols.

   Output: The sequence of element in reverse order.

Sample Input:

3
Abc
bcdh
abcdef

Sample Output:

abcdef
bcdh
abc

10. Write a recursive function to calculate the sum of digits of a given number.