	Department of Computer Science and Engineering Faculty of Engineering, South Eastern University of Sri Lanka			
	Subject	CS53003: Data Structure and Algorithms		
	Batch	E18	Semester	5

Lab no and title : Lab 02: Iteration and Recursion

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1. Write a recursive function that computes the sum of all numbers from 1 to n, where n is given as parameter. Test the program for input n = 100;

```

Start here x EX01.cpp x
1  #include<iostream>
2
3  using namespace std;
4
5  int CalculateSum(int m) {
6      if (m!=0) {
7          return m+CalculateSum(m-1);
8      }
9  }
10
11 int main() {
12     int n;
13     cout<<"Enter the number of elements :";
14     cin>>n;
15     cout<<"Total is "<<CalculateSum(n);
16 }
17

```

```

"E:\Campus Semseters\5th Semester\CS 53003 Data Structure and Algorithms\Lab\02\Final\EX0...
Enter the number of elements :100
Total is 5050
Process returned 0 (0x0)   execution time : 1.884 s
Press any key to continue.

```

2. Write C++ programs that use both recursive and non-recursive functions to find the factorial of a given integer.

Non-recursive

```
Start here X EX01.cpp X EX02part01.cpp X
1  #include<iostream>
2
3  using namespace std;
4
5  int main(){
6      int n;
7      cout<<"Enter the number :";
8      cin>>n;
9      int Factorial = 1;
10     for (int i=1;i<=n;i++){
11         Factorial = Factorial*i;
12     }
13     cout<<"The Factorial of "<<n<<" is "<<Factorial;
14
15 }
16
```

```
"E:\Campus Semesters\5th Semester\CS 53003 Data Structure and Algorithms\...
Enter the number :5
The Factorial of 5 is 120
Process returned 0 (0x0)   execution time : 1.662 s
Press any key to continue.
```

Recursive

```
Start here X EX01.cpp X EX02part01.cpp X EX02part2.cpp X
1  #include<iostream>
2
3  using namespace std;
4
5  int Factorial(int m){
6      if (m>1){
7          return m*Factorial(m-1);
8      }
9  }
10
11 int main(){
12     int n;
13     cout<<"Enter the number :";
14     cin>>n;
15     cout<<"Factorial of "<<n<<" is "<<Factorial(n);
16
17 }
18
```

```
"E:\Campus Semseters\5th Semester\CS 53003 Data Structure and Algorithms\Lab\02\Fi...
Enter the number :5
Factorial of 5 is 120
Process returned 0 (0x0)   execution time : 3.026 s
Press any key to continue.
```

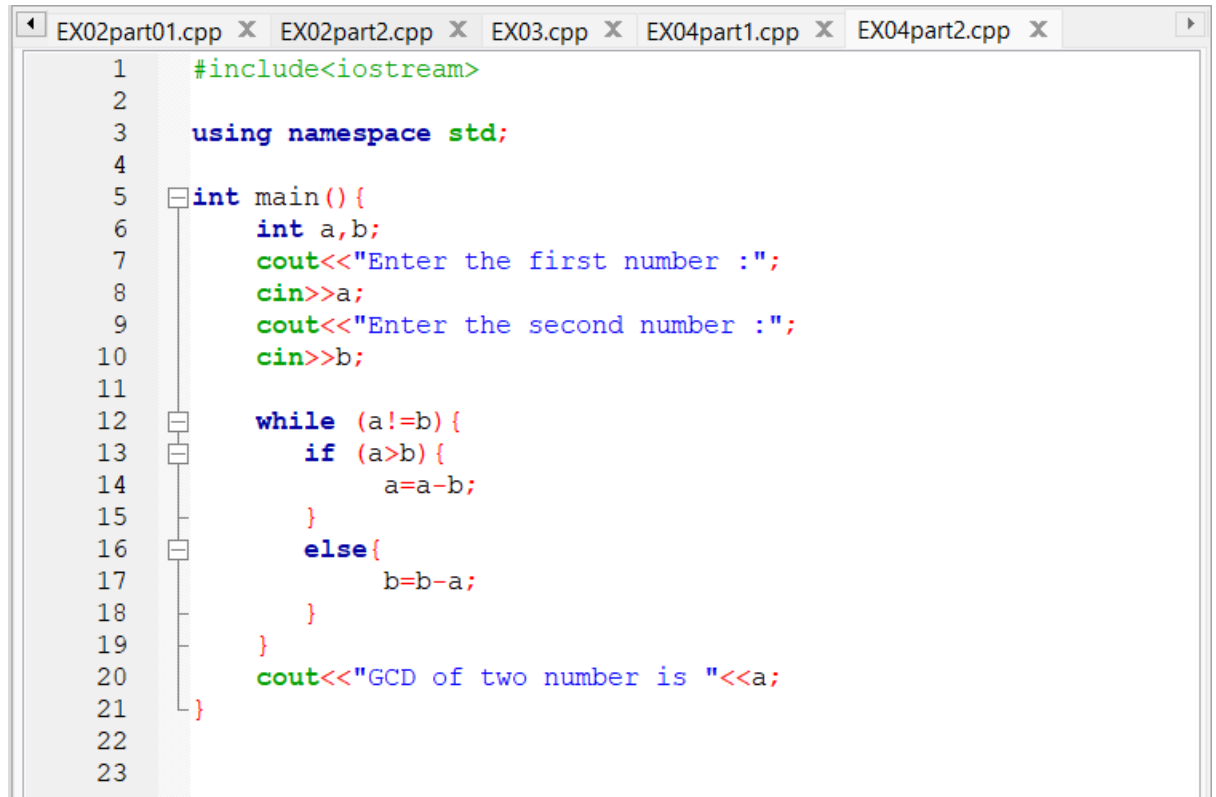
3. Write a recursive function that computes the Fibonacci number corresponding to its positive integer argument, so that, for example, `fibonacci(7) == 13`.

```
Start here X EX01.cpp X EX02part01.cpp X EX02part2.cpp X EX03.cpp X
1  #include<iostream>
2
3  using namespace std;
4
5  int Fibonacci(int m){
6      int fib = 1;
7      if (m>2){
8          fib = Fibonacci(m-1) + Fibonacci(m-2);
9          return fib;
10     }
11     else{
12         return 1;
13     }
14 }
15
16 int main(){
17     int n;
18     cout<<"Enter the number :";
19     cin>>n;
20     cout<<"Fibonacci "<<n<<": "<<Fibonacci(n);
21 }
22
```

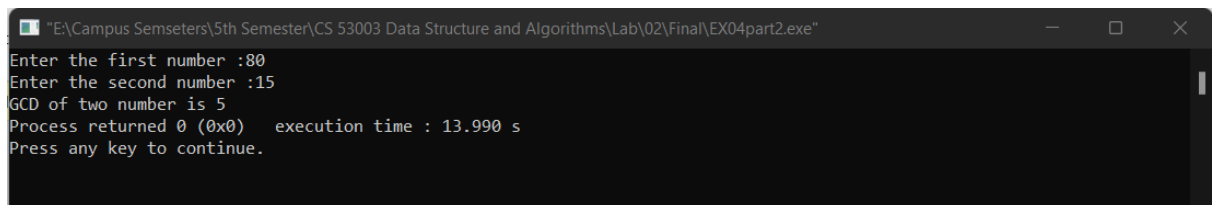
```
"E:\Campus Semseters\5th Semester\CS 53003 Data Structure and Algorithms\Lab...
Enter the number :7
Fibonacci 7: 13
Process returned 0 (0x0)   execution time : 1.351 s
Press any key to continue.
```

4. Write C++ programs that use both recursive and non-recursive functions to find the GCD (greatest common divisor) of two given integers

Non-recursive

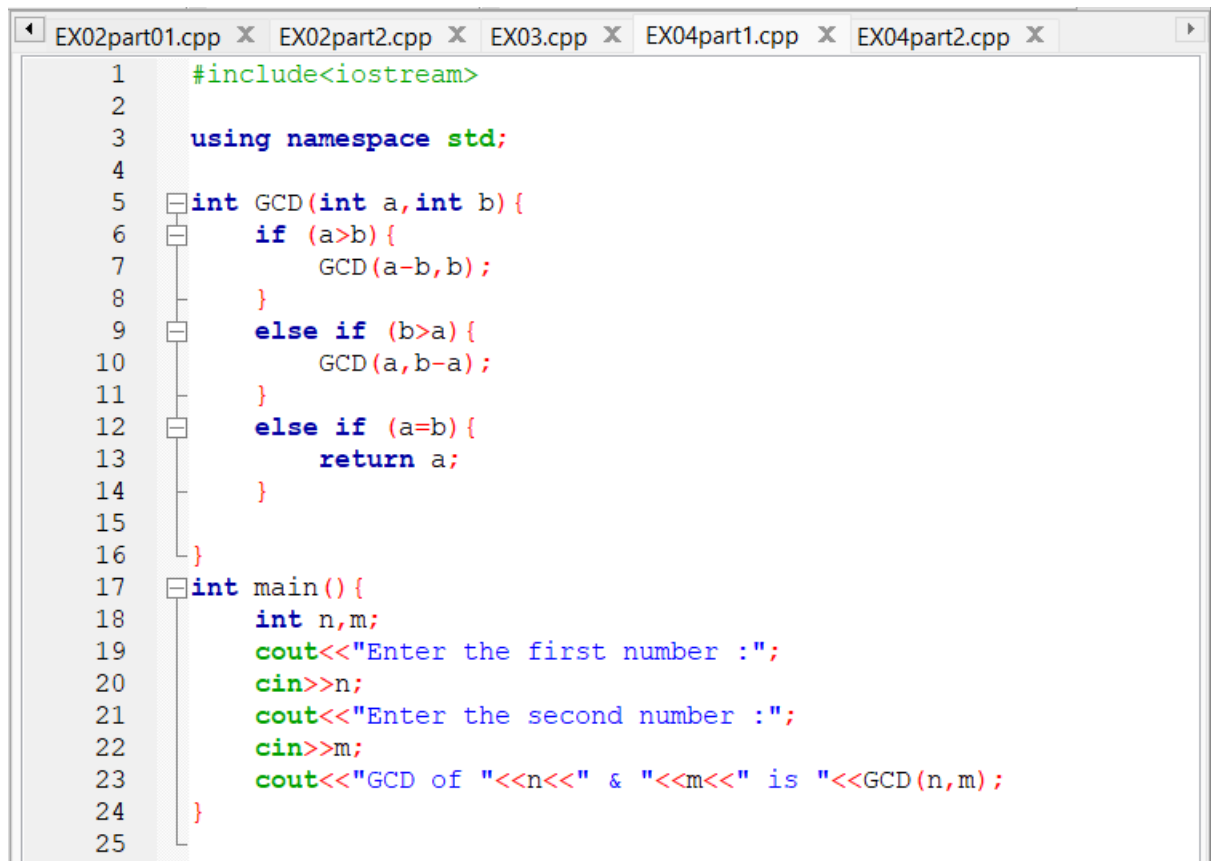


```
1  #include<iostream>
2
3  using namespace std;
4
5  int main(){
6      int a,b;
7      cout<<"Enter the first number :";
8      cin>>a;
9      cout<<"Enter the second number :";
10     cin>>b;
11
12     while (a!=b) {
13         if (a>b) {
14             a=a-b;
15         }
16         else{
17             b=b-a;
18         }
19     }
20     cout<<"GCD of two number is "<<a;
21 }
22
23
```

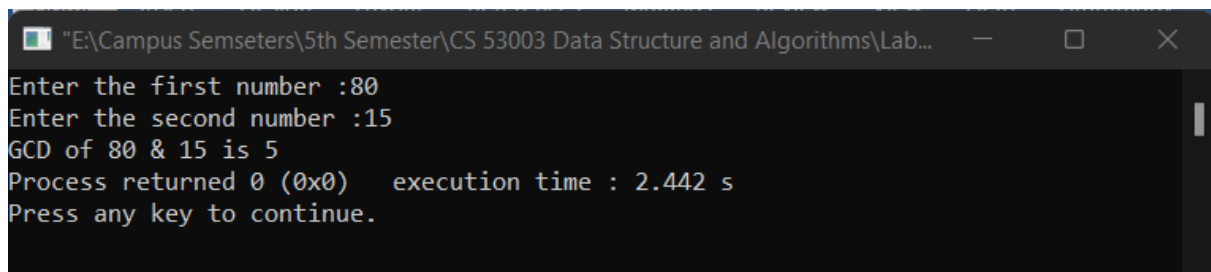


```
"E:\Campus Semseters\5th Semester\CS 53003 Data Structure and Algorithms\Lab\02\Final\EX04part2.exe"
Enter the first number :80
Enter the second number :15
GCD of two number is 5
Process returned 0 (0x0)   execution time : 13.990 s
Press any key to continue.
```

Recursive



```
1  #include<iostream>
2
3  using namespace std;
4
5  int GCD(int a,int b){
6      if (a>b){
7          GCD(a-b,b);
8      }
9      else if (b>a){
10         GCD(a,b-a);
11     }
12     else if (a==b){
13         return a;
14     }
15 }
16
17 int main(){
18     int n,m;
19     cout<<"Enter the first number :";
20     cin>>n;
21     cout<<"Enter the second number :";
22     cin>>m;
23     cout<<"GCD of "<<n<<" & "<<m<<" is "<<GCD(n,m);
24 }
25
```



```
"E:\Campus Semesters\5th Semester\CS 53003 Data Structure and Algorithms\Lab...
Enter the first number :80
Enter the second number :15
GCD of 80 & 15 is 5
Process returned 0 (0x0)   execution time : 2.442 s
Press any key to continue.
```

5. Write a recursive function that finds and returns the minimum element in an array, where the array and its size are given as parameters.

```
Start here x EX01.cpp x EX02part01.cpp x EX02part2.cpp x EX03.cpp x EX04part1.cpp x EX04part2.cpp x EX05.cpp x
1  #include <iostream>
2  using namespace std;
3
4  int findmin(int[],int size);
5
6  int main()
7  {
8      int array[6]={74,10,23,785,-5,7};
9      cout<<"smallest element of array is: " << findmin(array,5)<<endl;
10     return 0;
11 }
12
13 int findmin(int array[],int counter)
14 {
15     int smallest;
16     if (counter==1)
17         return array[0];
18     else
19     {
20         smallest = findmin (array+1,counter-1);
21         if (smallest<array[0])
22             return smallest;
23         else
24             return array[0];
25     }
26 }
```

```
"E:\Campus Semseters\5th Semester\CS 53003 Data Structure and Algorithms\Lab\02\EX05.ex...
smallest element of array is: -5

Process returned 0 (0x0)   execution time : 0.059 s
Press any key to continue.
```
