ARAB ACADEMY FOR SCIENCE & TECHNOLOGY
COURSE: INTRODUCTION TO COMPUTER PROGRAMMING
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ASSIGNMENT (12)

1. The greatest common divisor of integers x and y is the largest integer that evenly divides both **x** and **y**.
   a) Write a recursive method called ***GCD*** that returns the greatest common divisor of x and y. The ***GCD*** of **x** and **y** is defined as follows: if **y** is equal to **0**, then ***GCD(x,y)*** is **x**; otherwise, ***GCD(x,y)*** is ***GCD(y,x%y)***.
   b) Trace the function you wrote, showing your steps, to figure out the result of each of the following: GCD(12,10), GCD(5,15) and GCD(8,5).

2. Write the output of the following programs by tracing each of them (show your steps), then give a "one-word" description of the function (ABC) in each program:

```
public class MyProgram1
{
        public static int ABC(int x, int y)
        {
         if(y==0)
           return (1);
         else
           return (x * ABC(x,y-1) );
        }

        public static void main(String[] args)
        {
         System.out.println( ABC(2,4) );
        }
}
```

```
public class MyProgram2
{
        public static int ABC(int x, int y)
        {
         if(y==0)
           return (0);
         else
           return (x + ABC(x,y-1) );
        }

        public static void main(String[] args)
        {
         System.out.println( ABC(5,3) );
        }
}
```

3. **Using recursive functions, solve the following problems:**

   a) Evaluate the Factorial of a given number,
   Fact(n)= n*Fact(n-1)
   Fact(1)=1
   Fact(0)=1

n	0	1	2	3	4	5	6	…
Fact(n)	1	1	2	6	24	120	720	…

b) Evaluate the Fibonacci of a given number,
Fib(n)=Fib(n-1)+Fib(n-2)
Fib(1)=1
Fib(0)=0

n	0	1	2	3	4	5	6	7	8	…
Fib(n)	0	1	1	2	3	5	8	13	21	…

4. **Using the two previous functions in questions (3-a) and (3-b), write a program to evaluate the following formula:**
   1!/Fib(1) + 2!/Fib(2) + 3!/Fib(3) + 4!/Fib(4) + …… + n!/Fib(n)
   where, n is an input entered by the user.

5. Solve each of questions (2-a), (2-b), (3-a) and (3-b) using iterative functions (i.e. using loops) instead of the recursive functions that have been used.