



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,
 $\text{Fact}(n) = n * \text{Fact}(n-1)$
 $\text{Fact}(1) = 1$
 $\text{Fact}(0) = 1$

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,

$$\text{Fib}(n) = \text{Fib}(n-1) + \text{Fib}(n-2)$$

$$\text{Fib}(1) = 1$$

$$\text{Fib}(0) = 0$$

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:

$$1!/\text{Fib}(1) + 2!/\text{Fib}(2) + 3!/\text{Fib}(3) + 4!/\text{Fib}(4) + \dots + n!/\text{Fib}(n)$$

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.