# Lab 4: Recursion

## *Setup*

1. In command line, change directory to lab directory which was created by cloning your bitbucket lab repository. If you haven't clonned your repository, you should clone it as described in previous labs.
2. Create a new directory named "lab4" in lab folder and change directory to lab4
   a) mkdir lab4
   b) cd lab4

## *Exercise 1 : Greatest Common Divisor using Loop*

In this exercise we will implement the Euclidean algorithm for calculating GCD is given below

GCD(a,b) where a and b are integers.

For all a , b with a > b there is a q (quotient) and r (remainder) such that

$$a = qb + r$$

with r < b or r = 0

This is calculated repeatedly by making a=b and b=r until r=0.
Finally, GCD=b.

1. Create a class named GCDLoop which has a main method.
2. The class will accept two numbers and return the GCD as shown below

```
> java GCDLoop 90 50
```

**> 10**

## *Exercise 2 : Greatest Common Divisor using Recursion*

1. Define the recrusive GCD function and the base case for the Euclidean algorithm.
2. Implement the fucntion in a class named GCDRec
3. The class will accept two numbers and return the GCD as shown below

```
> java GCDRec 90 50
```

**> 10**

## *Exercise 3 : Integer to Binary using Loop*

1. Create a class named Int2Bin
2. Write a method in this class which converts an integer to its binary representation using a

loop

3. Write another method converting an integer to its binary representation using a recursion
4. Your class should run and print output as follows

```
> java Int2Bin loop 199
```

**> 110001111**

```
> java Int2Bin rec 49
```

**> 110001**

NOTE: Your lab will **not be graded** if

- Your account name does not have the format described in lab1.pdf
- Your repository name is not lab
- Your files have compilation errors
- You haven't complete the steps described in exercises
- Your added/modified files are not submitted to Bitbucket.
  - You have to add commit and push files as described in lab1.pdf