# Computer Science 121

Lab 8
100 Points

**In this lab, you have four questions. You will be practicing loops in this lab.**
**You need to finish question1, 2 and 3 in the lab. You will not get any help from instructor or lab assistant for Q1. Upload Q1 to e-campus after you are done and demonstrate Q2 and Q3 to your instructor. You need to submit question Q4 in e-campus before the next lab and demonstrate during the next lab.**

**Also, include required comments at in the code:**

**If you do not include comments throughout your code, you will lose points!!!**

## 1    While Loop Exercise (20 Points)

### Name the class:  WhileLoop

Write the following program in the java editor and write the answer for the questions below. You will not get any help on this question from instructor or lab assistant. (Write the answers as a comment at the bottom of the java program and submit in e-campus):

```
import java.util.*;
public class WhileLoop
{
  public static void main(String[] args)
  {
    Scanner console = new Scanner(System.in);
    int num;
    System.out.print("Enter an integer between " +  "0 and 5: ");
    num = console.nextInt();
    System.out.println();

    while (num >= 0 && num != 6){
      System.out.print(num + " ");
      num++;
    }
  }
}
```

Write the answers to the following questions in the bottom of the program as comments and upload in ecampus (2 points each):

1. What is the output if the user enters 0?

2. What is the output if the user enters 3?

3. What is the output if the user enters 4?

4. What happens if the user enters -1?

5. Why does this happen?

6. What happens if the user enters 7?

7. Why does this happen?

8. What happens if the user enters 6?

9. Why does this happen?

10. How should the condition of the `while` loop be changed such that it stops if the number is not between 0 and 5. What is the correction in the code required?.

# 2 Binary Number (30 Points)

## Name the class: Binary

We are asked to take an integer number and print all of its binary digits. To do this, we are given the following algorithm:

1. Print the remainder of the number divided by 2.

2. Divide the number by 2.

3. Repeat steps 1 and 2 until the number is 0.

The program should **prompt the user to enter a number greater than zero.** If the user enters a negative number of zero, instead of terminating immediately (like we did in the previous lab), the program should continue to ask the user to enter a number greater than zero. The program will convert to binary only after it gets a number greater than 0.
For example, if the user were to enter 13, the binary equivalent is 1101. The output of the program would be

```
1
0
1
1
```

Note that the binary number is printed in reverse order (i.e., the number is read from bottom to top). This is intended.
Here is an example:

```
> run Binary
Enter a number:    -10

Enter a number:    -15

Enter a number:    5


1
0
1
>
```

# 3 Nested Loops (15 Points)

**Name the class:  NestedLoopExample**

Write a nested loop to create the following sequence of numbers:

```
1 2 3 4 5
1 2 3 4
1 2 3
1 2
1
```

Here is a screenshot:

```
> run NestedLoopExample
12345
1234
123
12
1
```

# 4    Population (35 Points)

**Name the class:  Population**

The population of town $A$ is less than the population of town $B$. However, the population of town $A$ is growing faster than the population of town $B$. Write a program that prompts the user to enter the population and growth rate of each town. The program outputs after how many years the population of town $A$ will be greater than or equal to the population of town $B$ and the populations of both the towns at the same time.

For example, if the population and growth rate for town $A$ are 5000 and 4%, respectively, and the population and growth rate for town $B$ are 8000 and 2%, respectively, then 25 years is when the population of town $A$ will be greater than or equal to the population of town $B$. Specifically, the population of town $A$ would be 13308, and the population of town $B$ would be 13110.


Here is a sample screenshot:

```
> run Population
Enter the current population of town A:   5000
Enter the current population of town B:   8000
Enter the growth rate of town A:   4
Enter the growth rate of town B:   2
After 25 year(s) the population of town A will be greater than or equal to the population of town B.
After 25 years, population of town A is 13308
After 25 years, population of town B is 13110
```


# Submission


When you are done, you will need to submit your code for all questions on eCampus. When logging onto eCampus, be sure to select your corresponding lab session instead of T01. When you actually submit your code, be sure to submit the .java file, not the .java˜ or .class files.