Seminar 3 (Iteration) – Exercises

1a. Write a program to display consecutive numbers between 2 numbers. Assume that the first number will always be less than the second. Display from the first number up to and including the second number, one number per line. Use a while loop. Input sample is as follows:

```
Enter first number: 3
Enter second number: 5
```

Output:

```
3
4
5
```

1b. Modify the above program to include display of sum of the consecutive numbers.

```
import java.util.Scanner;
public class Q1
{
   public static void main(String[] args){
        Scanner console = new Scanner(System.in);
        int num1 = console.nextInt();
        int num2 = console.nextInt();
        int sum=0;
        while ( num1 <= num2  )
        {
            System.out.println( num1 );
            sum = sum + num1; //sum+=num1;
            num1++;

        }
        System.out.println("Sum = " + sum);
   }
}
```

2. Repeat question 1 using for loop.

```
int sum = 0;
for ( ; num1<=num2; num1++)
{
   System.out.println(num1);
   sum += num1;
}
System.out.println("Sum = " + sum);
```

3. Modify question 1a to cater for any 2 integer arguments. The first can be greater, equal or less than the second integer. The display will still be from the smaller integer to the larger integer. E.g. if input argument is “3”, “5”, display 3, 4, 5 one on each line. If input is “5”, “3”, also display 3, 4, 5 one on each line. You are required to only use 1 set of loop.

```
public class Q3
{
   public static void main(String[] args)
   {
      //Assume num1 and num2 read in...

      if ( num1 > num2)
      {
         num1=Integer.parseInt(args[1]);
         num2=Integer.parseInt(args[0]);
      }
      for ( int i = num1; i<=num2; i++)
      {
          System.out.println(i);
      }
    }
}
```

4a. (Written exercise. Past year exam question)
The following is a short Java program. Examine it carefully and show the result obtained when the program is executed.

```
public class Q3
{
    public static void main(String args[])
    {
     for (int i = 0; i < 16; i=i+2 )
     {
         if ( i % 3 == 0 )
          System.out.println( i);
         else
          System.out.print( i );
         System.out.print('^');
     }
    }
}
```

```
0
^2^4^6
^8^10^12
^14^
```

4b. Rewrite the program in part a) using while loop.

```
int i=0;
while ( i < 16)
{
   if ( i % 3 == 0 )
      System.out.println( i);
   else
      System.out.print( i );
   System.out.print('^');
   i = i + 2;
}
```

5. Write a program that has 2 parameters, one representing a String and another integer. The program prints a number of lines of the string as specified by the integer. For example, if the string is “Java”, and the integer is 3, then the program displays

Java
Java
Java

```
public class Q5
{
    public static void main(String[] args)
    {
        String s = args[0];
        int n = Integer.parseInt(args[1]);
        for ( int i=1; i<=n; i++)
           System.out.println(s);
    }
}
```

6. Write a program that displays a multiplication table. Use the Scanner class to input an integer number. Input and display of result is as follows:

```
Enter number: 5
1 x 5 = 5
2 x 5 = 10
3 x 5 = 15
4 x 5 = 20
5 x 5 = 25
```

If the input is 5, the table displays 5 rows in multiples of 5.

```
import java.util.Scanner;

public class Q6
{
   public static void main(String[] args)
   {
      Scanner console = new Scanner(System.in);
      System.out.print("Enter number: ");
      int n = console.nextInt();
      for(int i=1 ; i<=n ; i++)
      {
        System.out.println(i + " x " + n + " = " + (i*n));
      }
   }
}
```

7. Write a Java program that displays a simple menu. It works as follows:

Menu
1. Option 1
2. Option 2
3. Option 3
4. Quit
Enter choice: 1
Option 1 selected

Menu
1. Option 1
2. Option 2
3. Option 3
4. Quit
Enter choice: 3
Option 3 selected

Menu
1. Option 1
2. Option 2
3. Option 3
4. Quit
Enter choice: 4
End of program

```
import java.util.Scanner;
public class Q7
{
    public static void main(String[] args)
    {
       Scanner console = new Scanner(System.in);
       while ( true )
       {
          System.out.println("Menu");
          System.out.println("1. Option 1");
          System.out.println("2. Option 2");
          System.out.println("3. Option 3");
          System.out.println("4. Quit");
          System.out.print("Enter choice: ");
          int choice = console.nextInt();
          if ( choice == 4)
            break;
          else if ( choice == 1)
             System.out.println("Option 1 selected");
          else if ( choice == 2)
             System.out.println("Option 2 selected");
          else if ( choice == 3)
             System.out.println("Option 3 selected");
       }
       System.out.println("End of program");
    }
}
```

8. Modify question 5 to read in the String and the number of times to repeat using the Scanner class. A sample session is as follows:

```
Enter String: Java
Number of times to repeat: 3
Java
Java
Java
Enter String: program
Number of times to repeat: 2
program
program
Enter String: exit
end
```

The program continues to prompt for another string until the user keys in “exit” to end the program.

```
import java.util.Scanner;
public class Q8
{
    public static void main(String[] args)
    {
       Scanner console = new Scanner(System.in);
       while ( true )
       {
          System.out.print("Enter String: ");
          String s = console.nextLine();
          if ( s.equals("exit") )
            break;
          System.out.print("Number of times to repeat: ");
          int n = console.nextInt();
          for ( int i=1; i<=n; i++)
             System.out.println(s);
       }
       System.out.println("end");
    }
}
```

9. Display the following 3 patterns. Use two sets of nested loops for each pattern:

```
+++++
++++
+++
++
+
```

```
X++++
+X+++
++X++
+++X+
++++X
```

```
12345
23456
34567
45678
56789
```

```
public class Q9
{
  public static void main(String[] args)
  {
      int n = Integer.parseInt(args[0]);
      //first pattern
      for ( int i=n; i>=1; i--)
      {
          for ( int j=1; j<=i; j++)
             System.out.print("+");
          System.out.println();
      }

      //Second pattern
      for ( int i = 1; i<=n; i++)
      {
          for (int j=1; j<=n; j++)
          {
              if(i==j)
                 System.out.print("X");
              else
                 System.out.print("+");
          }
          System.out.println();
      }

      //Pattern 3
      for ( int i=1; i<=5; i++)
      {
          for (int j=0; j<5; j++)
             System.out.print( (i+j) );
          System.out.println();
      }

  }
}
```

10. Write a program to play a “high low” guessing game. The program ‘thinks’ of a number (limit 1 to 100) and the user tries to guess the number. The program displays “Too high” if the number guessed is higher than the actual number and “Too low” if the number guessed is less than the actual number. The program continues until the user enters the correct guess. A sample session is as follows:

Enter your guess: **10**
Too low. Try again.
Enter your guess: **20**
Too high. Try again.
Enter your guess: **16**
You got it in **3** tries!

When the number guessed is correct, display a message including the number of tries taken to get the answer. The above interactive session is achieved using the Scanner class. The Random class is also used to generate a random number. The following generates a number from 1 to 100.

```
Random r = new Random();
int n = r.nextInt(100) + 1;
```

```
import java.util.*;

public class Q10
{
    public static void main(String[] args)
    {
       Scanner console = new Scanner(System.in);
       int answer = (int)(Math.random() * 100) + 1;
       System.out.println(answer); //print out the answer to help
       int count = 0;
       while (true)
       {
           System.out.print("Enter your guess: ");
           int guess = console.nextInt();
           count++;
           if ( guess==answer)
           {
               System.out.println("You got it in " + count + " tries!");
               System.out.print("Continue (y/n)? ");
               console.readLine(); //to clear buffer from nextInt();
               string reply = console.nextLine();
               if ( ! reply.equals("y") )
                  break;
               else
               {
                  answer = (int)(Math.random() * 100) +1;
                  count=0;
               }
           }
           else if (guess < answer)
                System.out.println("Too low. Try again!");
           else
                System.out.println("Too high. Try again!");

       }
    }
}
```