Tutorial 4

Problem Solving: Repetition (nested loop) & conditional structures

Section A: Self-Test

1. What is a 'nested' loop?

A loop that is inside another loop.

2. In what situation you need a nested loop?

It is necessary when a task performs a repetitive operation and that task itself must be repeated

3. In nested loops, the outer loop must be terminated before the inner loop.
   a. True b. False

4. Only For loops can be nested.
   a. True b. False

5. We can use for loops as outer loops and while loops as inner loops.
   a. True b. False

6. What makes up a nested loop?
   a. At least one loop inside of another loop
   b. One loop placed after another loop
   c. At least one If statement inside of a loop
   d. At least one Wait statement inside of a loop

7. You can only use nested loops once.
   a. True b. False

Section B: Hand Tracing

1. How many times is the `println` statement executed?

```
for(int i=1;i<2;i++) {
      for(int j=0;j<5;j++) {
            System.out.println(j + " ");
      }
}
```

0
1
2
3
4

2. What is the output of the following code segments?

```
for (int i = 0; i < 3; i++) {
      for (int j = 0; j < 4; j++) {
            System.out.print("(" + i + "," + j + ") ");
      }
}
```

(0,0) (0,1) (0,2) (0,3) (1,0) (1,1) (1,2) (1,3) (2,0) (2,1) (2,2) (2,3)

3. What is the output of the following code segments?

```
int n = 5;
for (int i = 0; i < n; i++) {
      for (int j = 0; j < i; j++) {
            System.out.print(j + " ");
      }
      System.out.println();
}
```

0
0 1
0 1 2
0 1 2 3

4. What is the output of the following code segments?

```
for (int i = 0; i < 5; i++) {
      for (int j = 0; j < 5; j++) {
            if ((i+j >= 5))
                  System.out.print('1');
            else
                  System.out.print('0');
      }
      System.out.println();
}
```

00000
00001
00011
00111
01111

5. Consider the following code segments.

```
1  Scanner sc = new Scanner(System.in);
2  int n, k, p, sum;
3  double avg;
4  n = sc.nextInt();
5  for(int i = 0; i < n; i++) {
6        k = sc.nextInt();
7        sum = 0;
8        for(int j = 0; j < k; j++) {
9              p = sc.nextInt();
10             sum = sum + p;
11       }
12       avg = (double) sum / k;
13       System.out.println(avg);
14 }
```

What is the output of the code segments if the input is as follows.

```
3
5 20 35 44 57 68
3 21 66 9
4 11 12 13 14
```

```
3
5 20 35 44 57 68
44.8
3 21 66 9
32.0
4 11 12 13 14
12.5
```

Section C: Write Code Segments

1. Write code segments that print a square based on the specified input which indicates the size of the square. For example, if the input is 5, then the output is as follows.

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

```
5  import java.util.Scanner;
6
7  public class SquarePattern {
8
9      public static void main(String[] args) {
10
11         Scanner sc = new Scanner(System.in);
12         int N = sc.nextInt();
13
14         for (int rows=1; rows<=N; rows++)
15         {
16             for (int columns=1; columns<=N; columns++)
17             {
18                 System.out.print(rows);
19             }
20             System.out.println();
21         }
22
23
24     }
25
```

Problems Javadoc Declaration Console

<terminated> handtrace [Java Application] C:\Users\Tie\.p2\pool\plu

```
5
11111
22222
33333
44444
55555
```

2. Write code segments that print a triangle based on the specified input which indicates the height of the triangle. For example, if the input is 5, then the output is as follows.

```
1
22
333
4444
55555
```

```java
import java.util.Scanner;
public class TrianglePattern {
    public static void main(String[] args) {

        int n = 0;

        Scanner sc = new Scanner(System.in);
        n = sc.nextInt();

        for (int i = 1; i <= n; i++) {
            for(int j = 1; j <= n; j++) {
                if (i==j){
                    for (int k=1;k<=j;k++)
                        System.out.print(j);
                }
            }
            System.out.println();
        }
    }
}
```

```
Problems  Javadoc  Declaration  Console
<terminated> TrianglePattern [Java Application] C:\Users\Tie\.p2\pool
5
1
22
333
4444
55555
```

3. Write code segments that print a square based on the specified input which indicates the size of the square. For example, if the input is 5, then the output is as follows.

```
+-+-+
+-+-+
+-+-+
+-+-+
+-+-+
```

```java
public class PosNegPattern {

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int N = sc.nextInt();

        for (int rows=1; rows<=N; rows++)
        {
            for (int columns=1; columns<=N; columns++)
            {
                if (columns % 2 == 0)
                    System.out.print("-");
                else
                    System.out.print("+");

            }
            System.out.println();
        }

    }
```

```
Problems  Javadoc  Declaration  Console
<terminated> PosNegPattern [Java Application] C:\Users\Tie\.p2\pool\plu
5
+-+-+
+-+-+
+-+-+
+-+-+
+-+-+
```

4. Write code segments that print a square based on the specified input which indicates the size of the square. For example, if the input is 4 5, then the output is as follows.

```
*****
*   *
*   *
*****
```

```java
import java.util.Scanner;
public class HollowSquare {

    public static void main(String[] args) {

        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();
        int m = sc.nextInt();


            int i, j;
            for (i = 1; i <= n; i++)
            {
                for (j = 1; j <= m; j++)
                {
                    if (i == 1 || i == n ||
                            j == 1 || j == m)
                        System.out.print("*");
                    else
                        System.out.print(" ");
                }
                System.out.println();
            }

        }
    }
```

```
Problems  Javadoc  Declaration  Console
<terminated> HollowSquare [Java Application] C:\Users\Tie\.p2\poo
4 5
*****
*   *
*   *
*****
```