JOBSHEET 11

LOOPING 2

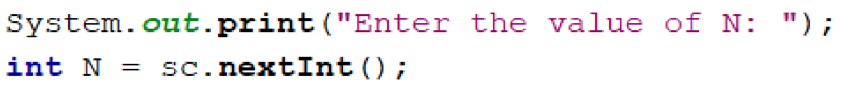
1. Objective

- Students are able to understand the concept of nested loop
- Students are able to explain nested loop writing format
- Students are able to implement nested loop flowchart using Java programming language

2. Laboratory

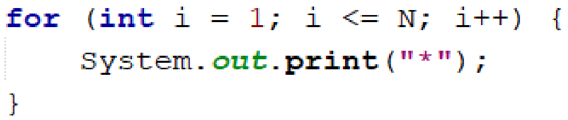
2.1 Experiment 1: Loop Review

1. This experiment is aimed at reviewing the loop that had been studied in the previous week. In experiment 1, a program will be made to make a view * N times sideways.
2. Create a new class with the name **Star** and save it in the **Star.java** file
3. Write the basic structure of the Java programming language which contains the **main()** function
4. Because the program requires input from the keyboard, it is necessary to import the **Scanner** class, so add the import syntax in the top line of the program.
5. In the **main()** function that has been created, declare a **Scanner** object with the name **sc**
6. On the next line, write the instructions for entering the value to be stored in variable **N**



```
System.out.print("Enter the value of N: ");
int N = sc.nextInt();
```

7. On the next line, create a loop syntax using **for**



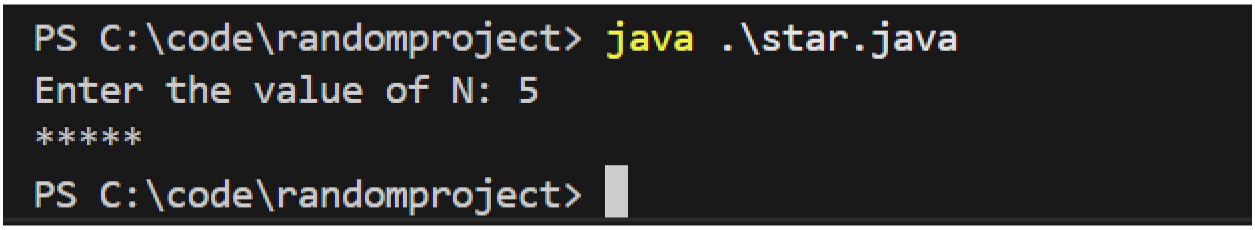
```
for (int i = 1; i <= N; i++) {
    System.out.print("*");
}
```

Note: *please note that the print command is used, not println because we want to display without any new lines*

8. Compile and run the program.

9. Observe the results, match the results of the running programs that you have created according to the following display

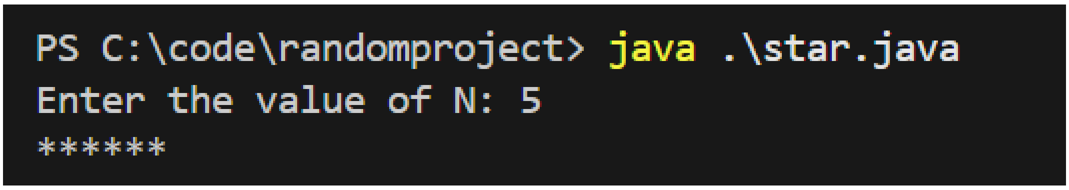
```
Enter the value of N: 5
*****
```



```
PS C:\code\randomproject> java .\star.java
Enter the value of N: 5
*****
PS C:\code\randomproject>
```

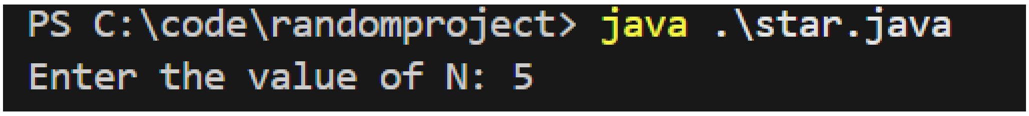
Questions!

1. If in **for** loop, the initialization **i = 1** is changed to **i = 0**, what is the result? How can It be like that? **There will be 6 times of * because when you change the initialization from i = 1 to i = 0 the code will start from 0,1,2,3,4,5**



```
PS C:\code\randomproject> java .\star.java
Enter the value of N: 5
******
```

2. If in **for** loop, condition **i <= N** is changed to **i > N**, what is the result? How can It be like that? **The program will immediately stop because the condition is i > n. If you entered n = 5 the condition is i > 5 and the loop is never executed**



```
PS C:\code\randomproject> java .\star.java
Enter the value of N: 5
```

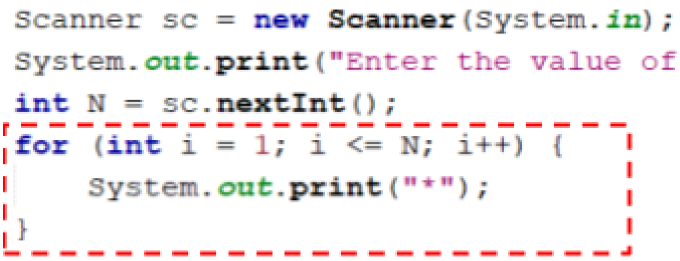
3. If in **for** loop, the condition for step **i++** is changed to **i--** what is the result? How can It be like that? **The loop starts at i = 1 and checks if i <= N. With i--, the value of i becomes 0, -1, -2, and so on. Since the value of i will always be less than or equal to 5, the condition i <= N will always be true, and the loop will never end.**

2.2 Experiment 2: Square Star

1. In Experiment 2, an experiment was carried out on nested loops. The case that will be solved is to create a square display *, with side lengths of N. Suppose N is entered as 5, then the results are as follows:

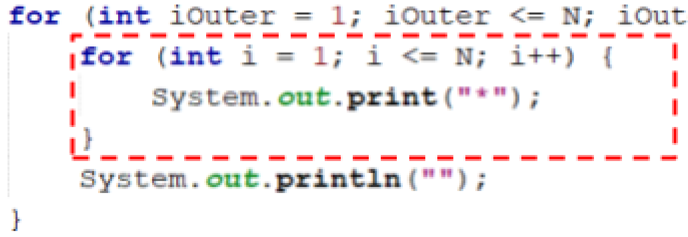
```
*****
*****
*****
*****
*****
```

2. If you look closely, it's actually like the case of Experiment 1, isn't it? In Experiment 1, for example, the input N has a value of 5, then what will be produced is ***** (we can think of this as an **inner loop** that displays 5 stars *****), then for the case of Experiment 2, this is not the result of experiment 1 does it just need to be repeated N times? (by adding an **outer loop** to repeat the **inner loop** process N times)
3. Create a new class with the name **Square** and save it in the **Square.java** file
4. Because the program requires input from the keyboard, it is necessary to import the **Scanner** class, so add the import syntax in the top line of the program.
5. Create a **main()** function, and add the same program code as the contents of the **main()** function in Experiment 1



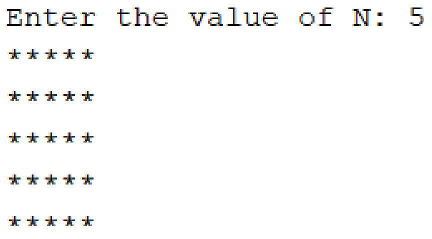
```
Scanner sc = new Scanner(System.in);
System.out.print("Enter the value of N: ");
int N = sc.nextInt();
for (int i = 1; i <= N; i++) {
    System.out.print("*");
}
```

6. Compile and run the program. Make sure the results given are the same as in Experiment 1
7. Pay attention to the iterative syntax used to print * N times sideways. In step 5, we make **for** loop structure (red box) as an **inner loop**
8. Furthermore, the inner loop needs to be repeated N times to display the * symbol to generate output like step 1. Thus, it is necessary to add an **outer loop**



```
for (int iOuter = 1; iOuter <= N; iOuter++) {
    for (int i = 1; i <= N; i++) {
        System.out.print("*");
    }
    System.out.println("");
}
```

9. Compile and run the program.
10. Observe the results, match the results of the running programs that you have created according to the following display



```
Enter the value of N: 5
*****
*****
*****
*****
*****
```

Questions!

1. Pay attention to outer loop. If in **for** syntax, the initialization **iOuter = 1** is changed to **iOuter = 0**, what is the result? How can it be like that?

   There will be 6 times of *** because when you change the initialization from iOuter = 1 to iOuter = 0 the code will start from 0,1,2,3,4,5**

2. Return the program to normal with initialization **iOuter = 1**. Then pay attention to the inner loop. If in **for** syntax, the initialization **i = 1** is changed to **i = 0**, what is the result? How can it be like that? **There will be 6 times of * because when you change**

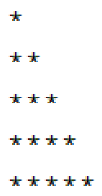
the initialization from i = 1 to i = 0 the code will start from 0,1,2,3,4,5

3. What is the difference between outer loop and inner loop?
   The outer loop controls the rows and the inner loop controls the columns

4. Why is it necessary to add the syntax **System.out.println();** under inner loop? What will happen if the syntax is omitted? **To ensure the stars start on a new row, ll the stars from all the rows would be printed on a single and continuous line**
5. Commit and push the changes to GitHub

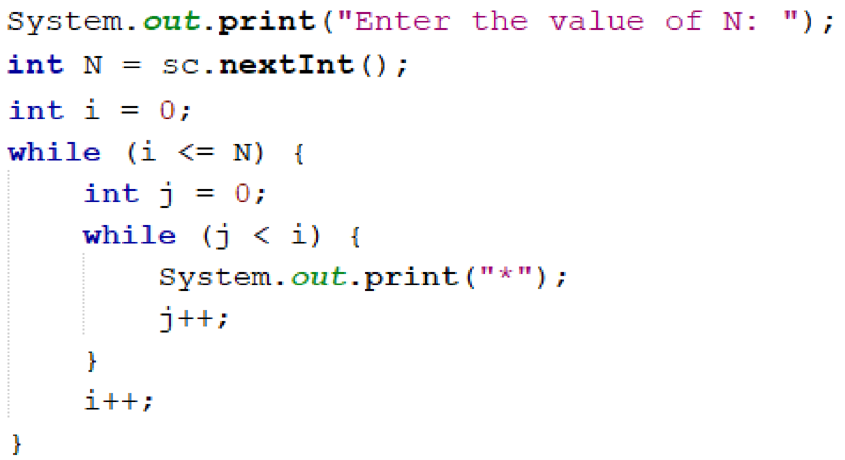
2.3 Experiment 3: Triangle Star

1. In Experiment 3, a right-angled triangle with a height of N was carried out. Suppose N is entered as 5, then the results are as follows:



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

2. Create a new class with the name **Triangle** and save it in the **Triangle.java** file
3. Because the program requires input from the keyboard, it is necessary to import the **Scanner** class, so add the import syntax in the top line of the program.
4. Create a **main()** function, and fill in the following program code into the **main()** function



```java
System.out.print("Enter the value of N: ");
int N = sc.nextInt();
int i = 0;
while (i <= N) {
    int j = 0;
    while (j < i) {
        System.out.print("*");
        j++;
    }
    i++;
}
```

5. Compile and run the program. Observe the results!

Questions!

1. Look at the results, does the output produced with a value of N = 5 match the following display? No it does not

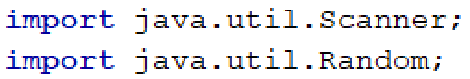
```
*
**
***
****
*****
```

2. If not, which parts should be improved or added? Describe any parts that need to be improved or added! **Add** System.out.println(); **under the i++;**

   Answer : wee need to add System.out.prinln next to i++ to print to print the outer loop

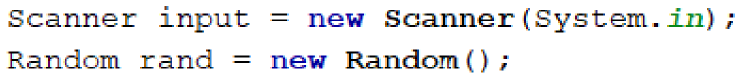
2.4 Experiment 4: Guess the Number Quiz

1. Create a new class with the name **Quiz** and save it in the **Quiz.java** file
2. Add Scanner and Random libraries in the top line of the program



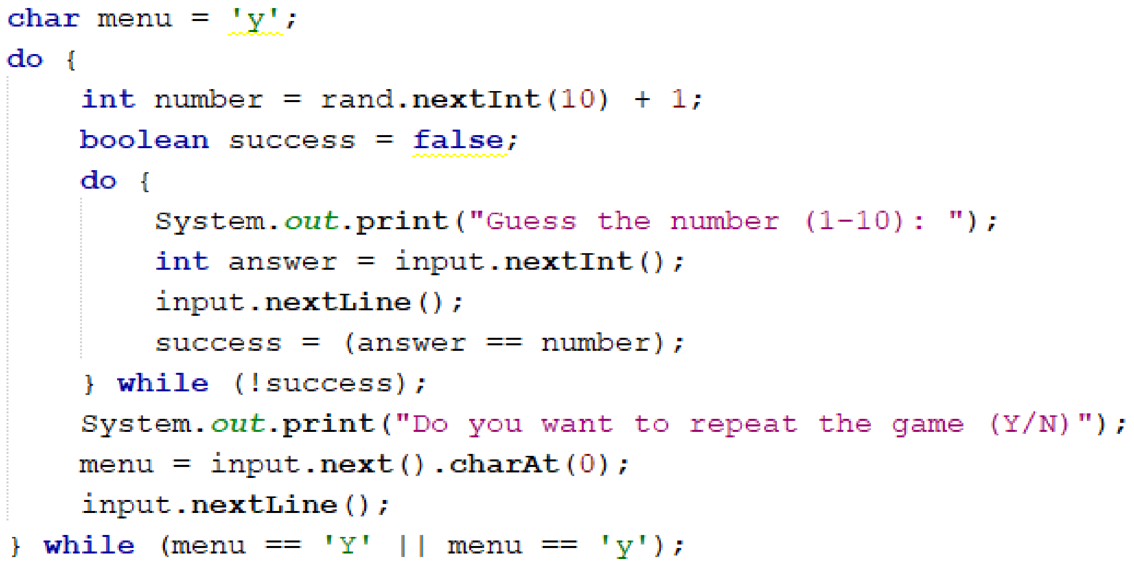
```java
import java.util.Scanner;
import java.util.Random;
```

3. Create a **main()** function
4. In the **main()** function, make a **Scanner** declaration with the name **input** and **Random** declaration with the name **rand**. In this case, Random is used to randomize the numbers



```java
Scanner input = new Scanner(System.in);
Random rand = new Random();
```

5. Then on the next line, add the following syntax



```java
char menu = 'y';
do {
    int number = rand.nextInt(10) + 1;
    boolean success = false;
    do {
        System.out.print("Guess the number (1-10): ");
        int answer = input.nextInt();
        input.nextLine();
        success = (answer == number);
    } while (!success);
    System.out.print("Do you want to repeat the game (Y/N)");
    menu = input.next().charAt(0);
    input.nextLine();
} while (menu == 'Y' || menu == 'y');
```

Note: the **input.nextLine()** syntax in that snippet is used to ignore the new line character

6. Compile and run the program. Observe the results!

Questions!

1. Explain the program flow in Experiment 4!

   Answer : first a random number is generated from 1 to 10, the inner do while loop checks if the number is correct. If its incorrect the program will loop again, if its correct the program will set the success to true and ask if the user want to play again, if they want to play again they can type Y or y to play

2. What must be done to discontinue (not repeat) the game? When the user entered n or anything else except y/Y

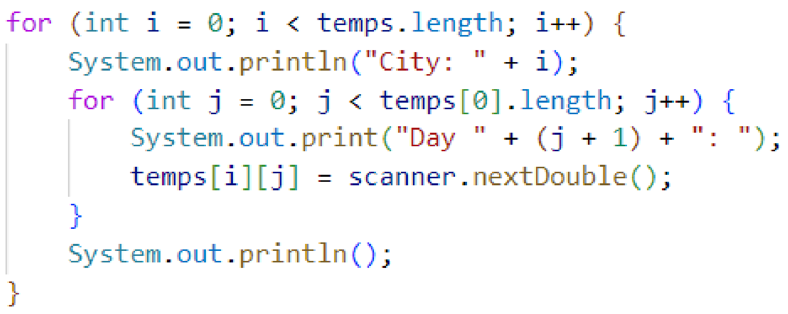
   Answer: fill the request to play again anything beside y

3. Modify the program above, so that it can display information about: input the guess value entered by the user, whether it is smaller or greater than the answer (number) randomly determined by the computer!

4. Commit and push the changes to GitHub

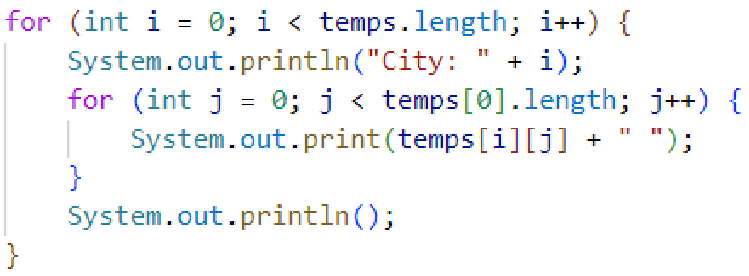
2.5 Experiment 5: Filling and Displaying Arrays

1. Create a new class with the name **NestedLoopStudentID**
2. Create a **main()** function
3. In the **main()** function, add a declaration for Scanner named **scanner** and a 2-dimensional array declaration named **temps** with 5 rows and 7 columns of type **double**
4. Add the following program code



```
for (int i = 0; i < temps.length; i++) {
    System.out.println("City: " + i);
    for (int j = 0; j < temps[0].length; j++) {
        System.out.print("Day " + (j + 1) + ": ");
        temps[i][j] = scanner.nextDouble();
    }
    System.out.println();
}
```

5. Then, also add the following several lines of program code



```
for (int i = 0; i < temps.length; i++) {
    System.out.println("City: " + i);
    for (int j = 0; j < temps[0].length; j++) {
        System.out.print(temps[i][j] + " ");
    }
    System.out.println();
}
```

6. Compile and run the program. Observe the results!

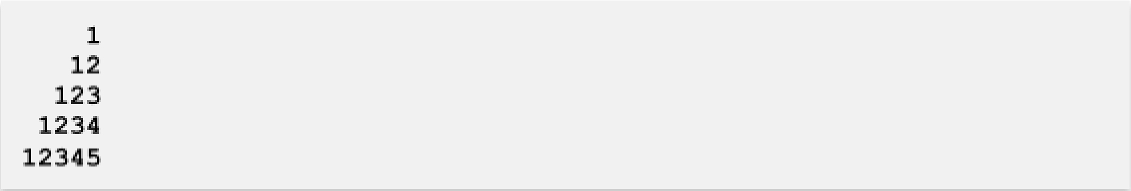
   Note: *This program example is a case example for storing temperature data in a city. Check back to last week's material slides.*

Questions!

1. Explain the program flow in Experiment 5!
2. Modify the program to display an array using foreach!
3. Modify the program so that it can display the average value for each city!
4. Commit and push the changes to GitHub

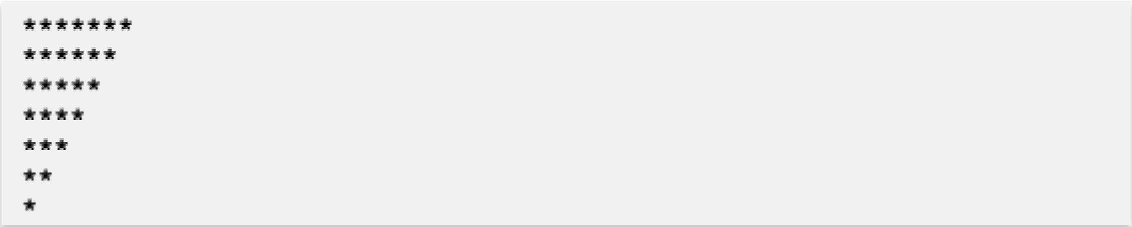
3. Assignment

1. Create a program to print a numeric triangle display as below based on the N input (minimum N value is 3). Example N = 5



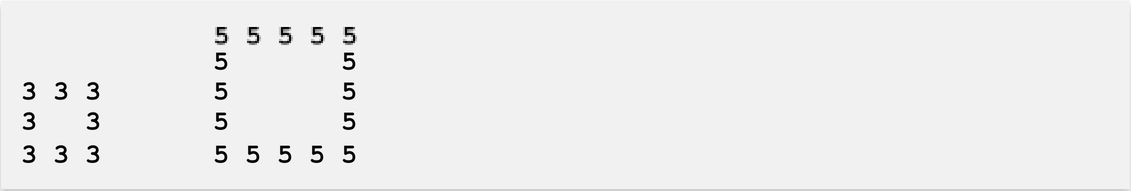
```
    1
   12
  123
 1234
12345
```

2. Create a program to print the star triangle view shown below based on the N input (minimum N value is 5). Example N = 7



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

3. Create a program to print a square numeric display like the one below based on N input (minimum N value is 3). Example N = 3 and N = 5



```
            5 5 5 5 5
            5       5
3 3 3       5       5
3   3       5       5
3 3 3       5 5 5 5 5
```

4. In 2024, Malang State Polytechnic will host the Porseni national event. There are several sports that are competed in, such as **badminton**, **table tennis**, **basketball**, and **volleyball**. Each sport sends its **5 best athletes** from all polytechnics throughout Indonesia to take part in this biannual event. Create a data storage to display

information on the **names of athletes** from the various branches mentioned in **ascending** order.

5. Implement the flowchart of the features you created in the previous theory assignment about nested loops!
6. Don't forget, all program code must be pushed to your repository.