Homework 1 - Lab Algorithm and Data Structures

Ramzy Izza Wardhana - 21/472698/PA/20322

Homework 1.1 - Random Number within range

Brief Explanation: In order to random a number from a particular range, we need upper bound and lower bound value. First, find the difference between max and min to obtain the value of the distance between 2 numbers then increment it with 1. Then add it with its minimum value to set it as the "starting" of our range.

However, a different case with problem c, in which only outputs an even number within the range. To achieve this, we first multiply the random with 4 and cast it with an integer datatype in order to obtain a value range of 0-3. Next, we could multiply it by 2 so that we will get numbers of 0, 2, 4, 6 and lastly increment it by 2 so that our number range is 2, 4, 6, 8.

a. Random Number A = {0,1,2,3}

```
//A. Code that generate random number A = {0,1,2,3}
int min_a, max_a, num_a, range_a;
min_a = 0;
max_a = 3;
range_a = (max_a - min_a) + 1;

//Test run with 20 random test iteratively
for(int i = 0; i < 20;i++){
    double a = ((Math`.random() * range_a) + min_a);
    num_a = (int)a;
    System.out.print(num_a + " ");
}
```

Result:

```
PS C:\Users\themi\Downloads\test-java\first-meet>
es' '-cp' 'C:\Users\themi\Downloads\test-java\first
1 2 3 3 1 0 0 2 1 1 3 3 2 2 3 2 1 2 3 0
PS C:\Users\themi\Downloads\test-java\first-meet>
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionM
0 1 0 2 1 2 3 1 2 3 1 2 2 3 2 1 2 3 0 0
PS C:\Users\themi\Downloads\test-java\first-meet>
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionM
0 2 2 1 3 1 2 3 3 0 3 1 0 2 1 0 2 0 2 1
PS C:\Users\themi\Downloads\test-java\first-meet>
```

b. Random Number A = {1,2,3.4.5.6}

```
//B. Code that generate random number A = {1,2,3,4,5,6}
int min_b, max_b, num_b, range_b;
min_b = 1;
max_b = 6;
range_b = (max_b - min_b) + 1;

//Test run with 20 random test iteratively
for(int i = 0; i < 20;i++){
    double b = ((Math.random() * range_b) + min_b);
    num_b = (int)b;
    System.out.print(num_b + " ");
}
```

Result:

```
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionM
4 5 1 3 4 6 3 3 6 5 5 4 3 2 1 1 4 3 6 4
PS C:\Users\themi\Downloads\test-java\first-meet>
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionM
5 3 2 6 3 6 4 3 5 3 5 1 5 3 2 1 5 4 5 6
PS C:\Users\themi\Downloads\test-java\first-meet>
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionM
1 4 6 5 5 5 2 1 4 3 3 3 5 2 3 6 4 5 2 4
PS C:\Users\themi\Downloads\test-java\first-meet>
```

c. Random Number C = {2,4,6,8}

```
//C. Code that generate random number A = {2,4,6,8}
int num_c;

//Test run with 20 random test iteratively
for(int i = 0; i < 20;i++){
    num_c = (int)(Math.random() * 4) * 2 + 2;
    System.out.print(num_c + " ");
}
```

Result:

```
PS C:\Users\themi\Downloads\test-java\first-meet>
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionM
6 8 2 4 2 2 8 4 2 8 2 6 8 4 6 8 2 8 8 2
PS C:\Users\themi\Downloads\test-java\first-meet>
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionM
2 8 8 6 4 6 4 2 2 2 4 8 4 4 6 2 4 6 2 8
PS C:\Users\themi\Downloads\test-java\first-meet>
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionM
8 8 4 8 4 6 2 4 4 8 2 4 6 4 8 6 2 6 8 6
PS C:\Users\themi\Downloads\test-java\first-meet>
```

d. Random Number D = {-5,-4, … , 4, 5}

```
        //D. Code that generate random number A = {-5,-4,...,4,5}
        int min_d, max_d, num_d, range_d;
        min_d = -5;
        max_d = 5;
        range_d = (max_d - min_d) + 1;

        //Test run with 20 random test iteratively
        for(int i = 0; i < 20;i++){
            double d = ((int)(Math.random() * range_d) + min_d);
            num_d = (int)d;
            System.out.print(num_d + " ");
        }
```

Result:

```
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMe
-3 -1 -1 -3 -2 4 -3 5 -3 -5 -5 1 4 5 4 2 4 1 -3 2
PS C:\Users\themi\Downloads\test-java\first-meet>  c
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMe
1 -1 0 2 -2 -2 1 1 3 -4 1 3 -2 2 2 2 1 -2 -2 -3
PS C:\Users\themi\Downloads\test-java\first-meet>  c
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMe
1 -3 -1 -2 0 -4 -4 -2 -5 0 -1 2 3 1 -5 -5 0 5 -4 0
PS C:\Users\themi\Downloads\test-java\first-meet>  c
-18\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMe
2 1 1 3 -4 -2 0 5 1 4 -3 2 1 -5 5 -4 -5 0 3 4
PS C:\Users\themi\Downloads\test-java\first-meet>
```

Homework 1.2 - Multiplication Table

Brief Explanation: To construct a multiplication matrix table, we will implement it using nested for loops with respect to i and j as our counter ranging from 1 - 9 since our objective is to create multiplication tables of 1 until 9. Using the concept of concatenation, we can combine both strings (‘x’ and ‘=’) with the incrementing integer.

```
public class homework2{
    public static void main(String[] args){
        //create nested for loops to construct multiplication matrix table
        for(int i = 1; i <= 9; i++){
            for(int j = 1; j <= 9; j++){
                System.out.print(i + "x" + j + " = " + i*j + "   ");
            }
            System.out.println();
        }
    }
}
```

Result:

```
PS C:\Users\themi\Downloads\test-java\first-meet>  & 'C:\Program Files\Java\jdk-18\bin\java.exe'
es' '-cp' 'C:\Users\themi\Downloads\test-java\first-meet\bin' 'homework2'
1x1 = 1   1x2 = 2   1x3 = 3   1x4 = 4   1x5 = 5   1x6 = 6   1x7 = 7   1x8 = 8   1x9 = 9
2x1 = 2   2x2 = 4   2x3 = 6   2x4 = 8   2x5 = 10   2x6 = 12   2x7 = 14   2x8 = 16   2x9 = 18
3x1 = 3   3x2 = 6   3x3 = 9   3x4 = 12   3x5 = 15   3x6 = 18   3x7 = 21   3x8 = 24   3x9 = 27
4x1 = 4   4x2 = 8   4x3 = 12   4x4 = 16   4x5 = 20   4x6 = 24   4x7 = 28   4x8 = 32   4x9 = 36
5x1 = 5   5x2 = 10   5x3 = 15   5x4 = 20   5x5 = 25   5x6 = 30   5x7 = 35   5x8 = 40   5x9 = 45
6x1 = 6   6x2 = 12   6x3 = 18   6x4 = 24   6x5 = 30   6x6 = 36   6x7 = 42   6x8 = 48   6x9 = 54
7x1 = 7   7x2 = 14   7x3 = 21   7x4 = 28   7x5 = 35   7x6 = 42   7x7 = 49   7x8 = 56   7x9 = 63
8x1 = 8   8x2 = 16   8x3 = 24   8x4 = 32   8x5 = 40   8x6 = 48   8x7 = 56   8x8 = 64   8x9 = 72
9x1 = 9   9x2 = 18   9x3 = 27   9x4 = 36   9x5 = 45   9x6 = 54   9x7 = 63   9x8 = 72   9x9 = 81
PS C:\Users\themi\Downloads\test-java\first-meet>
```

`