Programming in Java

Random Numbers

There are different means of generating random numbers:

- The static method **Math.**random generates *doubles* between 0 (inclusive) and 1 (exclusive).
- The Random class generates random integers, doubles, longs and so on, in various ranges.

1. Math.random()

The Java Math class has many methods for different mathematical operations. One of them is the random() method. It is a static method of the Math class. We can invoke it directly. *It does not accept any parameters and generates only double type random number greater than or equal to 0.0 and less than 1.0*. Before using the random() method, we must import the java.lang.Math class.

Example:

```
import java.lang.Math;

public class RandomInteger {
      public static void main(String[] args){
            for(int i =0; i<3; i++){
                  int randomInt = (int)(10.0 * Math.random());
                  System.out.println("pseudo random int: " + randomInt);
            }
      }
}
```

We can also use the following formula if we want to a generate random number between a specified range.

Math.random() * (max - min + 1) + min

2. The Random class

A Random object generates pseudo-random numbers. Class Random is found in the java.util package. It includes few methods for generating random values, such as:

- **nextInt()** returns a random integer
- **nextInt(max)** returns a random integer in the range [0, max). max must be a positive integer
- **nextDouble()** returns a random real number in the range [0.0, 1.0)
- **nextBoolean()** returns either true or false

***Example**:*

```
Random rand = new Random();
int randomNumber = rand.nextInt(10); //0-9
```

To get a random number from 1 to N

```
int n = rand.nextInt(20) + 1; // 1-20
```

To get a number in arbitrary range [min, max] inclusive:

```
nextInt(max - min +1) + min
```

Example:

```
//A random integer between 4 and 10 inclusive:
int n = rand.nextInt(7) + 4;
```

nextDouble( ) method returns a double between 0.0 - 1.0

To get a number in arbitrary range [min, max] inclusive:

```
nextDouble()*(max – min + 1) + min
```

Example:

```
//Get a random number value between 1.5 and 4.0:
double randomGpa = rand.nextDouble() * 2.5 + 1.5;
```

Example

Write a program that simulates rolling of two 6-sided dice until their combined result comes up as 7.

```
import java.util.Random;
public class Dice {
	public static void main(String[] args) {
		Random rand = new Random();
		int tries = 0;
		int sum = 0;
		while (sum != 7) { // roll the dice once
			int roll1 = rand.nextInt(6) + 1;
			int roll2 = rand.nextInt(6) + 1;
			sum = roll1 + roll2;
			System.out.println(roll1 + " + " + roll2 + " = " +
			 sum);
			tries++;
		}
		System.out.println("You won after " + tries + " tries!");
	}
}
```

Example

Write a program that generates ten numbers between 0 to 99

```
import java.util.Random;
public class RandomTest {
	public static void main(String[] args){
		System.out.println("Generating 10 random integers in range
		0..99.");
		Random randomGenerator = new Random();
		for (int idx = 1; idx <= 10; ++idx){
			int randomInt = randomGenerator.nextInt(100);
```

```
                System.out.println("Generated : " + randomInt);
            }
            System.out.println("Done.");
        }
}
```