



Random Number in JAVA

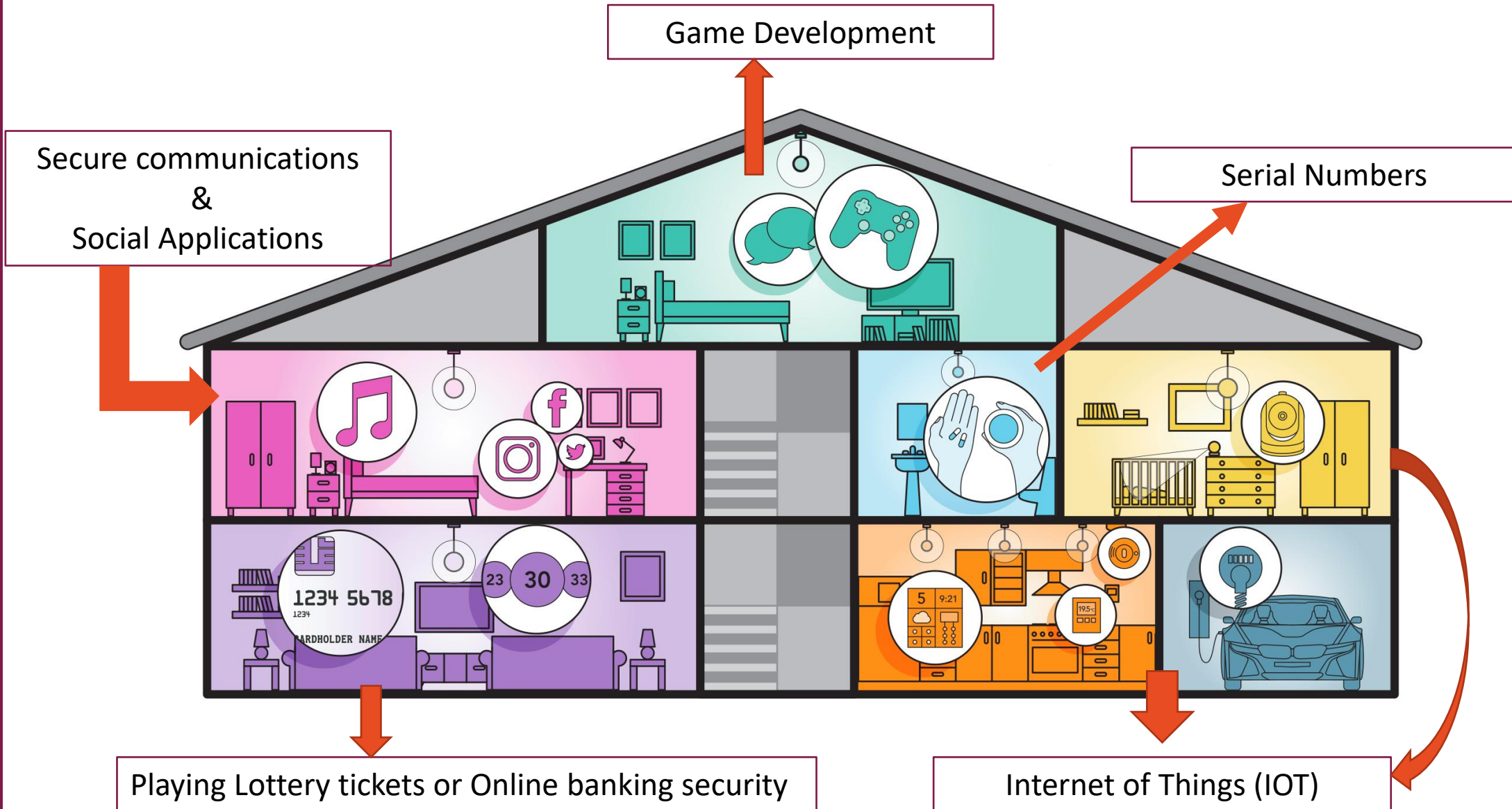


Computer Engineering
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Why Random Numbers??!!



Random Number Generator

- We take a brief diversion into a popular type of programming application
- simulation and game playing.
- A **Random** class can be used to generate pseudo-random numbers
- There are many ways to generate random numbers in Java e.g. **Math.random()**
- utility function, **java.util.Random** class

1. Using Random Class:

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

we add the import for the **Random** class

```
public class RandomCreation {
```

```
    public static void main(String[] args) {  
        // TODO Auto-generated method stub
```

```
        Random rdm=new Random();  
        int number=rdm.nextInt();  
        System.out.println(number);
```

Create an object of type Random

Declare a variable of type integer and initialize to a random number

Random Number Generator

- Method `nextInt()` returns a random number in the range - 2,147,483,648 to +2,147,483,647, inclusive.
- if we say `nextInt(10)`, it will return random number between 0 to 10.

```
Random rdm=new Random();  
int number=rdm.nextInt(10);  
System.out.println(number);
```

TRY it and see the OUTPUT

2. Using Math Class:

```
System.out.println(Math.random());
```

- **Math.random()** number return a random double value between 0 and 1, where 0 is inclusive and 1 is exclusive.

```
System.out.println((int)(Math.random()*(10)));
```

`(int) (Math.random()*(10))` number return a random **int** value between 0 and 10.

Random Number Generator (Example)

- **Example:** write a program to generate 10 random numbers in range 0 to 100 (both inclusive).

```
import java.util.Random;
public class RandomNum0to100 {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Random rdm=new Random();

        for(int jaran=1;jaran<=10;jaran++)
        {
            int number=rdm.nextInt(100);

            System.out.println("number "+jaran+": "+number);
        }
    }
}
```

TRY it and see the OUTPUT

Random Number Generator (Example)

- **Example:** update the program to test If the number is 5 stop the program and output the statement "number 5 NOT accepted"

```
for(int jaran=1;jaran<=10;jaran++)  
{  
    int number=rdm.nextInt(100);  
    // write the code to test if the number is 5  
    // tell the user "number 5 not accepted" and stop the program  
    System.out.println("number "+jaran+": "+number);  
}
```

number 1:15

number 2:59

number 3:44

number 4:92

number 5:79

number 6:28

Number 5 Not accepted

OR

number 1:18

number 2:33

number 3:90

number 4:63

number 5:21

number 6:9

number 7:11

number 8:57

number 9:95

number 10:17

Random Number Generator (Example)

- **Example:** write a program to ask the user to provide number of occurrence, maximum range and generates a number within the range.

```
import java.util.Random;
import java.util.Scanner;
public class RandomNumber_1 {
    public static void main(String[] args) {
        Random r=new Random();
        Scanner input=new Scanner(System.in);

        System.out.println("How many numbers do you want:");
        int amount_Number=input.nextInt();
        System.out.println("specify the max number in the random number range");
        int maxnumber=input.nextInt();
        for (int i = 0; i < amount_Number; i++) {
            int number=r.nextInt(maxnumber);
            System.out.println("Number"+i+": "+number);
        }
    }
}
```

run:

```
How many numbers do you want:
5
specify the max number in the random number range
30
Number0: 7
Number1: 18
Number2: 25
Number3: 6
Number4: 16
```

Scaling factor and Shifting Value:

- **Scaling factor:** represents the number of unique values that *nextInt* should produce.

```
Random rnd=new Random();
```

```
int face=rnd.nextInt(6);
```

```
System.out.println(face);
```

Scaling Factor

in this case 0, 1, 2, 3, 4 and 5

- If we have a six-sided dice has numbers between 1-6 on its face. So we shift the range of number by adding a shifting value.

```
Random rnd=new Random();
```

```
int face= 1 + rnd.nextInt(6);
```

Shifting value

Scaling Factor

```
System.out.println(face);
```

 in this case 1, 2, 3, 4, 5, and 6

Example:



- Rolling a die 20 times:

```
import java.util.Random;
public class RollingDie20Times {

    public static void main(String[] args) {
        // TODO Auto-generated method stub

        Random rnd=new Random();

        for(int time=1;time<=20;time++)
        {
            int face= 1+rnd.nextInt(6);
            System.out.print(face+" ");

            if(time %5 == 0)
                System.out.println();

        }
    }
}
```

OUTPUT 1:

```
5 2 1 1 6
6 3 3 4 2
3 2 4 1 1
6 3 6 2 1
```

OUTPUT 2:

```
3 1 1 2 2
3 2 4 2 3
4 5 1 3 6
1 4 2 3 4
```

Sample Development

- This program is to roll a die 6,000,000 times and show the frequency of each face occurred.

Step 1

```
import java.util.Random;

public class DieFaceFrequency {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Random rnd=new Random();
        int frequency1=0;
        int frequency2=0;
        int frequency3=0;
        int frequency4=0;
        int frequency5=0;
        int frequency6=0;

        System.out.println("face\tfrequency");
        System.out.printf("1\t%d\n2\t%d\n3\t%d\n4\t%d\n5\t%d\n6\t%d\n",
            frequency1,frequency2,frequency3,frequency4,
            frequency5,frequency6);

    }

}
```

Step 3

```
for(int time=1;time<=6000000;time++){
    int face=1+rnd.nextInt(6);
    switch(face){
        case 1:
            frequency1++;
        break;
        case 2:
            frequency2++;
        break;
        case 3:
            frequency3++;
        break;
        case 4:
            frequency4++;
        break;
        case 5:
            frequency5++;
        break;
        case 6:
            frequency6++;
        break;
    }
}
```

Step 2

Sample Development

- Write a java program to show an addition question of two randomly number, between 1 to 20, to the user. Then the program should ask the user to enter the answer, if the answer was correct print “**Correct, Well Done**”, otherwise print “**Wrong, Try again**”

```
import java.util.Random;
import java.util.Scanner;
public class ExampleRandom {
    public static void main(String[] args) {
        Scanner input=new Scanner(System.in);
        Random r=new Random();
        int number1=1+r.nextInt(20);
        int number2=+r.nextInt(20);
        int result=number1+number2;
        System.out.printf("%d + %d= ",number1,number2);
        int answer=input.nextInt();
        if(answer==result)
            System.out.println("Correct, Well Done");
        else
            System.out.println("Wrong, Try again");
    }
}
```

run:

18 + 2= 20

Correct, Well done