Day 2 : Special Logic Building Assignment: 10 special Recursion Programs

1. Print 1 to n without using loops

```java
package Assig2;

public class Q1 {

    public static void printNumbers(int n) {
        if (n > 0) {
            printNumbers(n - 1);
            System.out.print( n);
        }
    }

    public static void main(String[] args) {
        int n = 10;
        printNumbers(n);
    }
}
```

Output:

```
12345678910
```

2. Sum of natural numbers using recursion

```java
package Assig2;

public class Q2{

    public static int sum(int n) {
        if (n == 1) {
            return 1;
        } else {
```

```java
            return n + sum(n - 1);
        }
    }

    public static void main(String[] args) {
        int n = 10;
        int sum = sum(n);
        System.out.println("Sum of natural numbers from 1 to " + n + " is: " + sum);
    }
}
```

Output:

```
Sum of natural numbers from 1 to 10 is: 55
```

3. Mean of Array using Recursion

```java
package Assig2;

public class Q3 {

    public static int arraySum(int[] arr, int index) {
        if (index == arr.length - 1) {
            return arr[index];
        } else {
            return arr[index] + arraySum(arr, index + 1);
        }
    }

    public static double arrayMean(int[] arr, int index) {
        if (index == arr.length - 1) {
            return (double) arr[index] / arr.length;
        } else {
            return ((double) arr[index] + arraySum(arr, index + 1)) / arr.length;
        }
    }

    public static void main(String[] args) {
        int[] array = {1, 2, 3, 4, 5};
        double mean = arrayMean(array, 0);
        System.out.println("Mean of the array is: " + mean);
    }
}
```

Output:

```
Mean of the array is: 3.0
```

4. Sum of array elements using recursion

```java
package Assig2;

public class Q4 {

    public static int arraySum(int[] arr, int index) {
        if (index == arr.length - 1) {
            return arr[index];
        } else {
            return arr[index] + arraySum(arr, index + 1);
        }
    }

    public static void main(String[] args) {
        int[] array = {1, 2, 3, 4, 5};
        int sum = arraySum(array, 0);
        System.out.println("Sum of the array elements is: " + sum);
    }
}
```

Output:

```
Sum of the array elements is: 15
```

5. Decimal to binary number using recursion

```java
package Assig2;

public class Q5{
```

```java
    public static String decimalToBinary(int decimal) {
        if (decimal == 0) {
            return "0";
        } else if (decimal == 1) {
            return "1";
        } else {
            return decimalToBinary(decimal / 2) + decimal % 2;
        }
    }

    public static void main(String[] args) {
        int decimal = 10;
        String binary = decimalToBinary(decimal);
        System.out.println("Binary representation of " + decimal + " is: "
+ binary);
    }
}
```

Output:

```
Binary representation of 10 is: 1010
```

6. Sum of digit of a number using recursion

```java
package Assig2;

public class Q6 {

    public static int sumOfDigits(int number) {
        if (number == 0) {
            return 0;
        } else {
            return number % 10 + sumOfDigits(number / 10);
        }
    }

    public static void main(String[] args) {
        int number = 12345;
        int sum = sumOfDigits(number);
        System.out.println("Sum of digits of " + number + " is: " + sum);
    }
}
```

Output:

```
Sum of digits of 12345 is: 15
```

7. Print reverse of a string using recursion

```java
package Assig2;

public class Q7 {

    public static void printReverse(String str, int index) {
        if (index < str.length()) {
            printReverse(str, index + 1);
            System.out.print(str.charAt(index));
        }
    }

    public static void main(String[] args) {
        String str = "hello";
        printReverse(str, 0);
    }
}
```

Output:

```
Olleh
```

8. Program for length of a string using recursion

```java
package Assig2;

public class Q8 {

    public static int stringLength(String str) {

        if (str.equals("")) {
            return 0;
        } else {
```

```
            return 1 + stringLength(str.substring(1));
        }
    }

    public static void main(String[] args) {
        String str = "hello";
        int length = stringLength(str);
        System.out.println("Length of the string \"" + str + "\" is: " +
length);
    }
}
```

Output:

```
Length of the string "hello" is: 5
```

9. Tail recursion to calculate sum of array elements.

```
package Assig2;

public class Q9{

    public static int arraySum(int[] arr, int index, int sumSoFar) {
        if (index == arr.length) {
            return sumSoFar;
        } else {
            return arraySum(arr, index + 1, sumSoFar + arr[index]);
        }
    }

    public static void main(String[] args) {
        int[] array = {1, 2, 3, 4, 5};
        int sum = arraySum(array, 0, 0);
        System.out.println("Sum of the array elements is: " + sum);
    }
}
```

Output:

```
Sum of the array elements is: 15
```

10.Recursive function to check if a string is palindrome

```java
package Assig2;

public class Q10{

    public static boolean isPalindrome(String str) {

        if (str.length() <= 1) {
            return true;
        }

        return str.charAt(0) == str.charAt(str.length() - 1)
                && isPalindrome(str.substring(1, str.length() - 1));
    }

    public static void main(String[] args) {
        String str = "radar";
        if (isPalindrome(str)) {
            System.out.println(str + " is a palindrome.");
        } else {
            System.out.println(str + " is not a palindrome.");
        }
    }
}
```

Output:
radar is a palindrome.

11.Print Fibonacci Series in reverse order using Recursion

```java
package Assig2;

public class Q11 {

    public static int fibonacci(int n) {
        if (n <= 1) {
            return n;
        } else {
            return fibonacci(n - 1) + fibonacci(n - 2);
        }
    }


    public static void printReverseFibonacci(int n) {
        if (n <= 0) {
            return;
        } else {
            System.out.print(fibonacci(n) + " ");
            printReverseFibonacci(n - 1);
        }
```

```java
    }

    public static void main(String[] args) {
        int count = 10;
        System.out.println("Fibonacci series in reverse order:");
        printReverseFibonacci(count);
    }
}
```

Output:

```
Fibonacci series in reverse order:
    55 34 21 13 8 5 3 2 1 1
```