Sunil Neupane Recursion DSA lAB SHEET

1. Program to find the factorial of number using tail Recursion

```
class Sunil{
    public int factorial(int n,int result){
        if(n==1){
            return result;
        }
        else{
            return (factorial(n-1,n*result));
        }
    }
}
public class SunilDemo{
    public static void main(String[] args){
        Sunil ss=new Sunil();
        System.out.println(ss.factorial(5,1));

    }
}
```

Output 120

2. Factorial Using non-tail Recursion in java

```
class Factorial{
    public int factorial(int n){
        if(n==0 || n==1){
            return 1;
        }
        else{
            return n*fact(n-1);
        }
    }
}
class FactorialDemo{
    public static void main(String[] args){
        Factorial ff=new Factorial();
        System.out.println(ff.factorial(5));
    }
}
```

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Output 120

3. program to find the sum of Natural number using recursion

```
class Recursiondemo{
    public int sumofnatural(int n){
        if(n==0){
            return 0;
        }
        else{
            return n+sumofnatural(n-1);
        }
    }
}

class Recursion {
    public static void main(String[] args) {
        Recursiondemo obj1= new Recursiondemo();
        System.out.println(obj1.sumofnatural(4));

    }
}
```

output 10

4.program to generate Fibbonaci Number using Recursion in java

```
import java.util.Scanner;
class Sunil{
    public int fibo(int n){
        if(n==0){
            return 0;
        }
        else if(n==1){
            return 1;
        }
        else{
            return fibo(n-1)+fibo(n-2);
        }
    }
}
class Recursion {
    public static void main(String[] args) {
       Sunil ss=new Sunil();
       Scanner sc=new Scanner(System.in);
       System.out.println("Enter  how many number you want to generate
?");
       int a=sc.nextInt();
```

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```
        for(int i=0;i<a;i++){
        System.out.print(ss.fibo(i));
        }
    }
}
```

Outut : Enter how many number you want to generete? 10 0 1 1 2 3 5 8 13 21 34

5.Program To multiply two number using Java

```
class Mul{
    public int  mul(int x,int y){
        if(y==1){
            return x;
        }
        else{
            int mul=x+mul(x,y-1);
            return mul;
        }
    }
}
class Recursion {
    public static void main(String[] args) {
       Mul mm=new Mul();
       System.out.println(mm.mul(4, 5));
    }
}
```

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ouput 20

6. Write a java Program to print n to 1 using recursion

```
import java.util.Scanner;
class SunilDemo{
    public void printnum(int n){
        if(n==0){
            return ;
        }
        else{
        System.out.print(" "+n);
            printnum(n-1);
        }
```

```
    }
}
class Recursion {
    public static void main(String[] args) {
        Scanner sc=new Scanner(System.in);
        System.out.println("Input any Number ");
        int number =sc.nextInt();
        SunilDemo dd=new SunilDemo();
        dd.printnum(number);

    }
}
```

output : Input any Number 5 , 5 4 3 2 1

7.Java program fo find the 1 to n number using Recursion.

```
import java.util.Scanner;
class SunilDemo{
    public void printnum(int n){
        if(n==0){
            return ;
        }
        else{
            printnum(n-1);
            System.out.print(" "+n);
        }
    }
}
class Recursion {
    public static void main(String[] args) {
        Scanner sc=new Scanner(System.in);
        System.out.println("Input any Number ");
        int number =sc.nextInt();
        SunilDemo dd=new SunilDemo();
        dd.printnum(number);

    }
}
```

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Output: Input any Number 5, 1 2 3 4 5

8.Program To Find The gcd of a number using Recursion

```

```

```
import java.util.Scanner;
class GCD {
    public static void main(String[] args) {
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter Two numbers :");
        int n1=sc.nextInt();
        int n2=sc.nextInt();
        System.out.println("GCD of numbers :"+gcd(n1, n2));
    }
    public static int gcd(int n1,int n2){
        if(n1==0){
            return n2;
        }
        else{
            return gcd(n2%n1, n1);
        }
    }
}
```

Output: Enter Two numbers 4 5 GCD of numbers: 1

9.Program to solve Tower Of Hanoi Using Recursion In JAVA

```
class TowerofHanoi {
    public static void towerofhanoi(int n,char from_rod,char to_rod,char
aux_rod){
        if(n==0){
            return;
        }
        else{
            towerofhanoi(n-1, from_rod,aux_rod, to_rod);
            System.out.println("Move disk"+n+"From rod"+from_rod+"to
rod"+to_rod);
            towerofhanoi(n-1, aux_rod, to_rod,from_rod);
        }

    }
    public static void main(String[] args) {
        int N=3;
        towerofhanoi(N, 'A', 'C', 'B');
    }
}


 Output:
Move disk1From rodAto rodC
Move disk2From rodAto rodB
```

```
Move disk1From rodCto rodB
Move disk3From rodAto rodC
Move disk1From rodBto rodA
Move disk2From rodBto rodC
Move disk1From rodAto rodC
```

10.Java program to print x^n

```
class Recursion {
    public static int power(int x,int n){
        if(n==0){
        return 1;
        }
        else{
            return (x*power(x, n-1));
        }
    }
    public static void main(String[] args) {
        System.out.println(power(2, 3));
    }
}
```

Output: 8

11.Java program for nested recursion.

```
// Nested Recursion
class Recursion {
    public static int fun(int n){
        if(n>100){
            return n-10;
        }
        else{
            return fun(fun(n+11));
        }
    }
    public static void main(String[] args) {
        System.out.println(fun(89));
    }

}
```

output 91

12. Java code for prime number

13. Java recursion program for pattern printing