


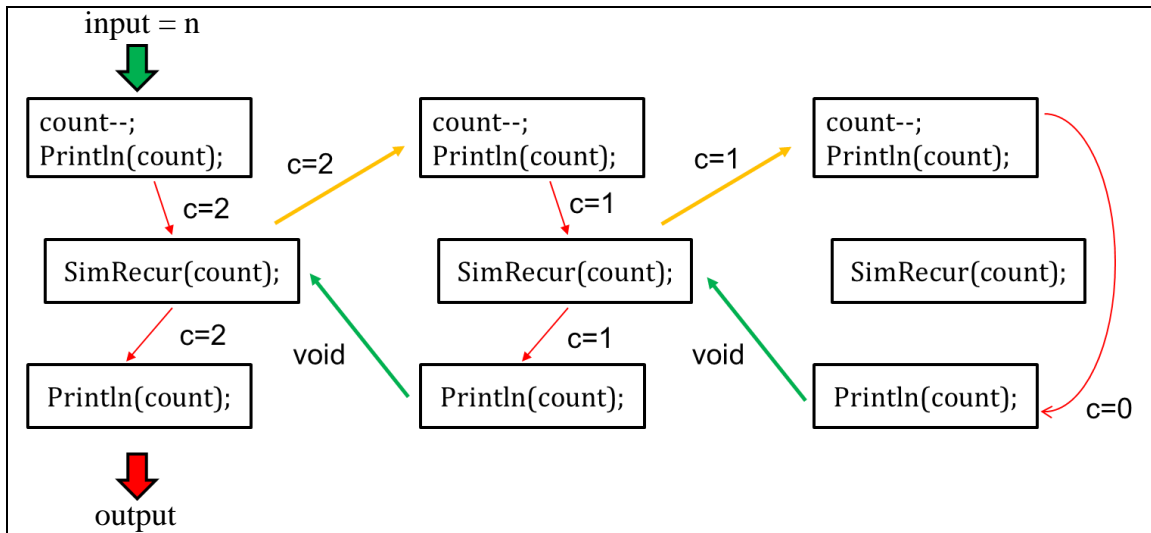
Data Structures and Algorithms Laboratory		
Laboratory 5: Recursion	School of Information Technology	
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Date:	Due date: on LMS	

Objective

- To understand the step of recursion
- To create the recursive program
- To implement the factorial and the power program

Exercise 1: (in-class) Simple recursive program shows how to trace the recursion.

Given the diagram of tracing a countdown algorithm.



Create the recursive program to calculate the result of the given diagram. User have to enter the input to the program.

Expected result:

```

C:\windows\system
Please enter number: 5
The value of the count is 4
The value of the count is 3
The value of the count is 2
The value of the count is 1
The value of the count is 0
Now, the count is "0"
Now, the count is "1"
Now, the count is "2"
Now, the count is "3"
Now, the count is "4"
D:\Java Eclipse Workspace\DSA>Pause
Press any key to continue . . .

```

Code (Recursion):

```
public static void simRecur(int count){  
    System.out.println("The value of the count is " + --count);  
    if(count > 0){  
        simRecur(count);  
    }  
    System.out.println("Now, the count is " + count);  
}
```

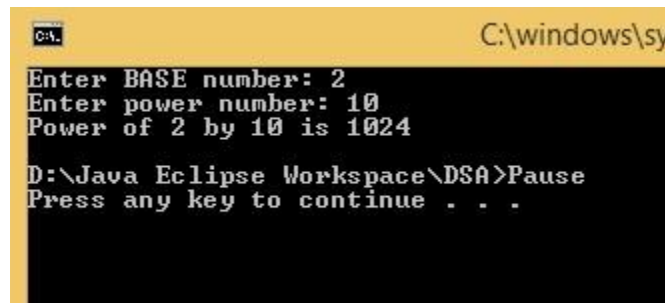
What are the **base case** and return value of the countdown algorithm?

When count > 0

Exercise 2: (in-class) Given the formulation for computing “Power”.

$$\text{Power}(x,n) = \begin{cases} 1 & \text{if } n = 0 \\ x * \text{power}(x, n-1) & \text{otherwise} \end{cases}$$

Create the recursive program to calculate the result of “Power” as the expected result.



```
C:\windows\sy
Enter BASE number: 2
Enter power number: 10
Power of 2 by 10 is 1024

D:\Java Eclipse Workspace\DSA>Pause
Press any key to continue . . .
```

Code (Recursion):

```
public static int powerRecur(int x, int n){
    if (n==0){
        return 1;
    }
    return x*powerRecur(x, n-1);
}
```

What are the **base case** and return value of the Power algorithm?

When $x = 1$

From the same recursive problem, modify the source code by using the repetition LOOP statement to solve the problem.

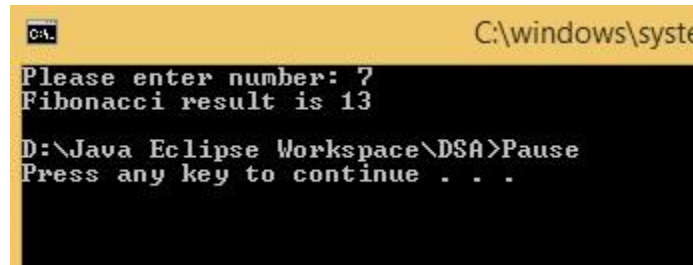
Code (Loop):

```
public static int powerLoop(int x, int n){
    int result=1;

    for(int i=1; i <=n; i++){
        result*=x;
    }

    return result;
}
```

Exercise 3: (Homework) Create the recursive program to calculate the result of “Fibonacci” as the expected result.



```
C:\windows\system32\cmd.exe
Please enter number: 7
Fibonacci result is 13
D:\Java Eclipse Workspace\DSA>Pause
Press any key to continue . . .
```

Code (Recursion):

```
public static int fibonacci(int n){
    if (n==0){
        return 0;
    }

    if (n==1 || n==2){
        return 1;
    }

    return fibonacci(n-2)+fibonacci(n-1);
}
```

What are the base case and return value of the Fibonacci algorithm?

When $n = 1$ or 2

From the same recursive problem, modify the source code by using the repetition LOOP statement to solve the problem.

Code (Loop):

```
public static int fiboLoop(int n){
    int current=0;
    int next=1;

    for(int i=0; i < n; ++i){
        int sum=current+next;
        current=next;
        next=sum;
    }
    return current;
}
```