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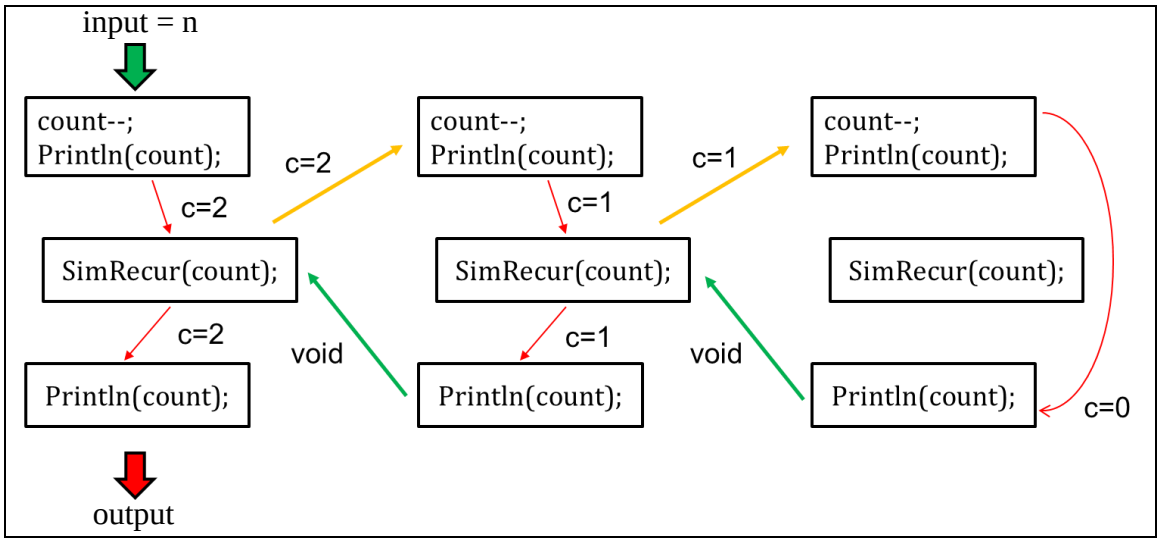
Date:	**Due date:** **on LMS**	

Objective

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

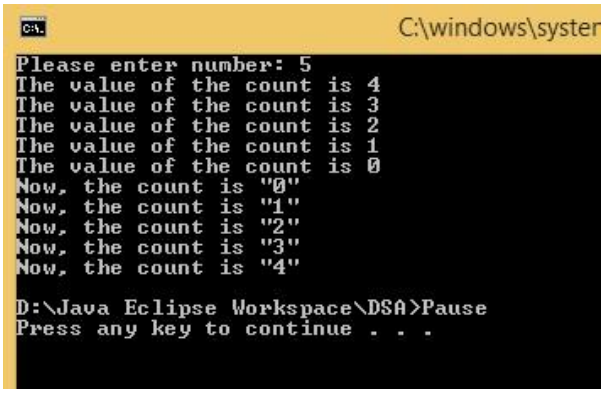
Exercise 1: (in-class) Simple recursive program shows how to trace the recursion.

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:



Code (Recursion):

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

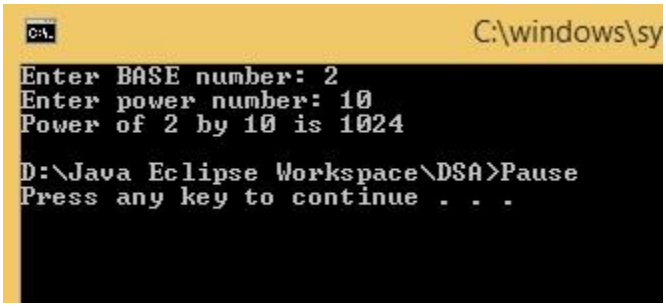
What are the base case and return value of the countdown algorithm?

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.



Code (Recursion):

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

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

When n = 0

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

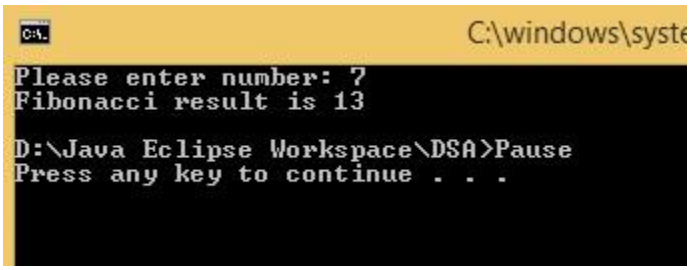
Code (Loop):

```
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.



Code (Recursion):

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

	if (n == 1 || n == 2) {
		return 1; //Real base case
	}

	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;
}
```