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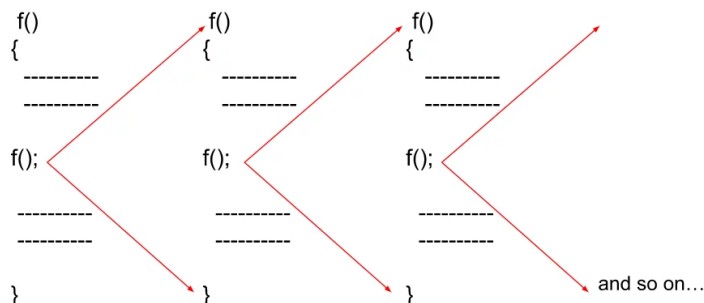
# Introduction to Recursion – Understand Recursion by printing something N times

**Pre-requisite:** The learner must know how to write a basic function in any language and how to make a function call from the main function.

## What is Recursion?

It is a phenomenon when a function calls itself indefinitely until a specified condition is fulfilled.

Let's understand recursion with the help of an illustration :



As we can see in the above image, a function is calling the same function inside its body. Since there is no condition to stop the recursive calls, the calls will run

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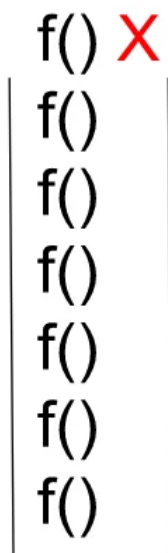
indefinitely until the stack runs out of memory ( stack overflow ).

### What is Stack Overflow in Recursion?

Whenever recursion calls are executed, they're simultaneously stored in a **recursion stack** where they wait for the completion of the recursive function. A recursive function can only be completed if a base condition is fulfilled and the control returns to the parent function.

But, when there is no base condition given for a particular recursive function, it gets called indefinitely which results in a Stack Overflow i.e, exceeding the memory limit of the recursion stack and hence the program terminates giving a Segmentation Fault error.

The illustration above also represents the case of a Stack Overflow as there is no terminating condition for recursion to stop, hence it will also result in a memory limit exceeded error.



### Base Condition

It is the condition that is written in a recursive function in order for it to get completed and not to run infinitely. After encountering the base condition, the function



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terminates and returns back to its parent function simultaneously.

To get a better understanding of how the base condition is an integral part of recursive functions, let us see an example below :

Let's say we have to print integers starting from 0 till 2 only, this will be how the pseudocode for it will look like

```
int count = 0;
void func(){

    if(count == 3 ) return;
    print(count);
    count++;
    func();

}

main()
{

    print();

}
```

According to this pseudocode, the function will increment and print the value of count and then return when the base condition becomes true i.e, it will only print 0,1,2 and 3 and then execution gets completed.

### Recursive code for printing numbers from 0 to 3 :

#### C++ Code

```
#include<bits/stdc++.h>
using namespace std;
int cnt = 0;

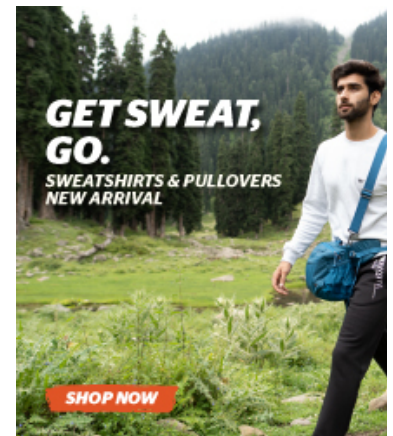
void print(){

    // Base Condition.
    if(cnt == 3) return;
    cout<<cnt<<endl;
```

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```

        // Count Incremented
        cnt++;
        print();

    }

    int main(){
        print();
        return 0;
    }

```

## Output

0  
1  
2

## Java Code

```

class Recursion {
    static int cnt = 0;
    static void print(){

        // Base Condition.
        if(cnt == 3 ) return;
        System.out.println(cnt);

        // Count incremented.
        cnt = cnt+1;
        print();

    }
    public static void main(String[] args) {
        print();
    }
}

```

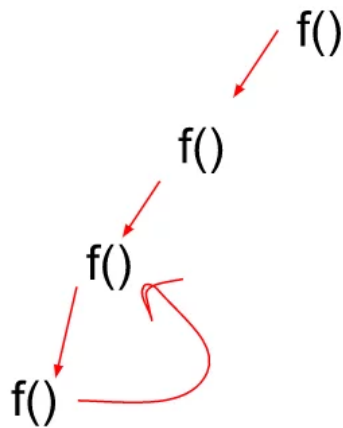
## Output

0  
1  
2

## Recursive Tree

A recursive tree is basically a representative form of recursion which depicts how functions are called and returned as a series of events happening consecutively.

It is a pictorial description of the process of recursion as illustrated below :



When a recursive call gets completed, the control returns back to its parent function which is then further executed until the last function waiting in the recursive stack returns.

As a summary of the lecture, the basics of recursion such as the following were clear to us :

- What is Recursion
- Base Condition
- Stack Overflow / Stack Space
- Recursion Tree

Special thanks to [Priyanshi Goel](#) for contributing to this article on takeUforward. If you also wish to share your knowledge with the takeUforward fam, [please check out this article](#). If you want to suggest any improvement/correction in this article please mail us at [write4tuf@gmail.com](mailto:write4tuf@gmail.com)

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