

# 02393 C++ Programming Exercises

## Assignment 11

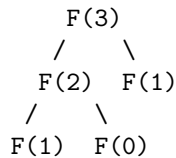
To be handed in via CodeJudge

<https://dtu.codejudge.net/02393-e19/assignments/>

**Fibonacci** Write a program that, given a non-negative integer  $n$ , provides some information about the computation of the straightforward implementation of the Fibonacci function  $F(n)$  recursively defined as follows

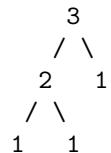
$$F(0) = 1 \quad F(1) = 1 \quad F(n) = F(n-2) + F(n-1)$$

For example if the input is 3, a recursive implementation of  $F(n)$  would result in the following tree of recursive calls:



We want to know all Fibonacci numbers computed, the size of the tree, its height and the number of leafs (i.e. nodes without sub-trees, which in this case correspond to the base cases of the recursive formulation).

The numbers should be provided in pre-order. That is, if we replace the calls  $F(i)$  by their result the tree would look like this:



And the pre-order traversal of such a tree would be 3 2 1 1 1, where:

- the first 1 refers to the left son of 2;
- the second 1 refers to the right son of 2;
- the third 1 refers to the right son of 1.

The format of the output should look like this:

```
Call tree in pre-order: 3 2 1 1 1
Call tree size: 5
Call tree depth: 3
Call tree leafs: 3
```

Use a tree structure to build first the tree of recursive calls and then output the required information using the tree structure.