02393 C++ Programming Exercises

Week 11, April 25, 2016

Hand-in via `dtu.codejudge.net/02393-f15`, before May 2, 5pm

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

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

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

```
    F(3)
   /    \
  F(2)  F(1)
 /    \
F(1)  F(0)
```

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:

```
    3
   / \
  2   1
 / \
1   1
```

And the pre-order traversal of such a tree would be `3 2 1 1 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.