Programmering for Computerteknologi

Opgave 1

a)

The number of arithmetic operations required to compute fact(5) is 10. The first arithmetic expression we encounter is in our for loop initialization, where the counter variable is updated (i = i + 1). This loop is run through a total of 5 times, as we start at i = 1 and end at i <= 5 (The last update of the counter variable being when it gets increased to 6, and when the program reads 6 <= 5, it skips over the loop and returns "f". The second arithmetic expression is found inside the for loop. The expression f = i * f contains the arithmetic operation *. Since it is inside the loop, and it runs every time the loop is run through, this command must also appear a total of 5 times. Thus, there are a total of 10 arithmetic operations used when computing fact(5).

b)

If we look at the factorial function at a meta level, we can see that it contains a for loop, in which there is one arithmetic operation contained inside the loop and one used to update the counter variable of the loop itself. Which means that for each repetition of the loop, there are 2 more arithmetic operations used, as the number of operations inside the loop stays constant and the counter variable updating itself is constant as well. This can be expressed as the function:

$$f(n) = 2 \cdot n$$

The function $f(n)$ will calculate the number of operations used as a function of "n", being the positive integer input in to the program.

Opgave 2

Answered in Visual Studio Code.

Github: https://github.com/Aarhus-University-ECE/assignment-8-au728452

Opgave 3

Answered in Visual Studio Code