INF-1100: Introduction to programming and computer behavior
Assignment 1

Sera Madeleine Elstad

September 10th, 2021

1 Introduction

The focus of the first assignment given in INF-1100 was to write and document a small C program. The aim of the assignment was to learn how to use the necessary tools to write and compile a program and to practice the skills of documenting the program. The assignment was completed by writing a total of 6 smaller functions, solving varying tasks. Even if the functions have varying purposes, the process of testing the implementation of each function by calling on them in the main function, was similarly for all of them. Getting the information needed for the functions to work are in serval tasks done by prompting the user. A menu, prompting the user to select which of the functions to execute, was created within the program with the intension of making it easier to execute the different functions creates in this assignment.

2 Technical Background

Different tools were used to solve the problems in the task. If-else statements were used to solve the first task, where the purpose was to "write a C function that compares two integers and prints the largest value of these integers". The if-else statement evaluates whether the condition inside the parentheses is true or false. Based on the evaluation there can be at least two outcomes. The condition for the if statement is inside the brackets and if it is fulfilled the code inside the curly brackets will run, if not the code will jump to either the else if, the else, or to the end of the code, depending one what you have after the if statement. By using the else if, a second condition can be checked in the same way as in if. The else statement does not have a condition, but the code inside the curly brackets will run if the conditions from the else and the if else not were fulfilled.

A for-loop inside another for-loop, also called a nested loop, was necessary to write the function that prints the triangle, where the number of lines is a parameter to the function, in task two. For-loops consists of an initialization statement, a test expression, and an update statement. The initialization statement is executed only ones, before the loop starts. When the initialization statement is executed the test expression is evaluated. If it is evaluated to be true the statement inside the body of the loop is executed and the update expression is updated, if the test expression is evaluated to be false the for-loop is terminated. A nested

loop is consisting of an outer loop and an inner loop, where the inner loop can run serval times without running the outer loop.

The function in task three are supposed to determine whether a number, A, have a given prime factor, B, or not. It should return 0 if A do not have B as a prime factor, and 1 if A has B as a prime factor. To do this the modulus operator were used. The modulus operator returns the remainder of an integer after the division. If the modulus returns 0 the division is quotient, if it returns anything else it is not quotient.

Writing a function that calculates log2 of an unsigned integer n was task 5. To do this the program has to find the most significant set bit in n and return the position of this bit. This is done by using the "right shift" bitwise operator and a while-loop. The wile-loop consists of a test expression which is evaluated to be true or false. If the expression is true, the code inside the body is executed and then the text expression is evaluated again. The loop will run until the test expression is evaluated to false, then the loop terminates, which it also will do if the test expression is evaluated to false in the beginning. The right shift operator has two operands, where the first operand is the value to be shifted and the second operand indicates the number of bit positions you want to shift (Yale & Patel, 2019).

The last function reverses a string. A sting, which is a type of arrays in C, is a sequence of characters which ends whit a /0. To reverse the sting a for-loop that swaps the characters of the string, and reads it backwards, were made. The %[\n], which is an alternative to gets, were used inside the scanf function because it tells the program to read everything until a new line appears.

Other used functions in the script are scanf and printf, which both are functions from the <stdio.h> library in C. The libraries contain serval built-in functions in C and must be included in the header to work. Scanf is used when prompting the user, and printf are used for printing different things in the terminal. In the menu the break statement is used inside the if statement, as a way for the user to break out of the loop.

3 Design and Implementation

In the header of the script are the libraries <stdio.h> and <string.h> included. They make it possible to use functions like "printf" and "strlen", that are included functions In C. The signature of all the written functions is also in the header because the main function comes right after and to make this possible the functions must be declared before main. This is a preference so there is also possible to write the main function after the self-written functions.

The main function is consisting of a while-loop and serval if else statements, which is made for the menu. In the beginning of the while-loop the menu is printed, and the user is prompt for input. After the menu are the if-else statements that each represents a given task and the opportunity to exit the program. Each of the if-else statements are built up similarly where several of the functions prompt the user for input with the scanf function. If the function does not ask the user for input, the value is declared inside the main function.

After the main function the code of the 6 smaller functions are found. They all have a given signature and the script for each is inside the curly brackets.

4 Evaluation and discussion

During the project there were some choices made. One of the choices was who to write the menu. There is at least two ways to make a menu, if-else and switch. The if-else do, as

described over, evaluate the condition inside the parentheses are true or false, and execute based on that definition. The switch statement allows the user to execute one code block among many alternatives. To write the menu in this assignment the if-else statements were used, but it would have been possible to use the switch instead of the if-else, it was just preferred to use the if-else.

5 Conclusion

The aim of the assignment was to learn how to use the necessary tools to write and compile a program and to practice the skills of documenting the program by writing 6 small functions. The functions are solving varying tasks and it was therefore necessary to use several different tools like, loops, operators, functions from the included libraries and more. All the functions are running and gives the correct output.

Acknowledgement

During this project my fellow students, Emile Steen, Ine Arcola, Daniel Andreassen, Helen Strand, and I have been discussing the tasks and provided each other with input on how to solve the tasks.

6 References

Programiz. (n.d.). *Programiz*. Retrieved August 2021, from https://www.programiz.com/c-programming

Yale , P., & Patel, S. (2019). *Indroduction to computing system, from bits & gates to C/C++ & beyond, third edtion.* McGraw-Hill Education.