CSE108 – Computer Programming Lab.

Lab 5

Date: 28.03.2025

Problem Description

In this lab, you will write a C program that generates a portion of a Collatz Sequence based on user input, writes the sequence to a .txt file, and then performs a number system conversion on the last value of the sequence based on the user's choice.

Part 1 – Collatz Sequence Generation (50 pts)

Takes two positive integers from the user:

- The first number is the starting value of the Collatz Sequence.
- The second number is how many elements of the sequence to generate.

Note: Collatz Sequence is defined only for positive integers. Do not allow the user to enter zero, negative, or non-integer values.

Generates the Collatz Sequence using the rules:

- If the current number is even, divide it by 2.
- If the current number is odd, multiply it by 3 and add 1.

Writes the generated sequence into a file named **collatz.txt**, with one number per line.

Additionally:

Print the entire generated sequence to the screen.

Print the last number in the sequence to the screen.

Function Requirement:

You must implement the following function:

```
int generateCollatzSequence(int start, int length, FILE* file);
```

This function generates the sequence, writes it to the file, prints to screen, and returns the last number in the sequence.

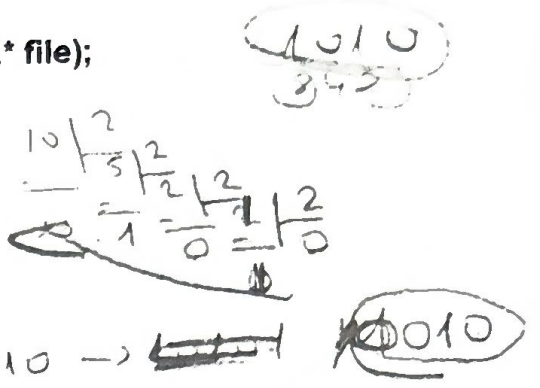
Part 2 – Number System Conversion (50 pts)

After printing the last number of the sequence, ask the user to choose one of the following conversions:

1 – Decimal to Binary Conversion : **void convertToBinary(int n, FILE* file);**

2 – Decimal to Hexadecimal Conversion : **void convertToHex(int n, FILE* file);**

3 – Decimal to Octal Conversion: **void convertToOctal(int n, FILE* file);**



Numbering System		
System	**Base**	**Digits**
Binary	2	0,1
Octal	8	0,1,2,3,4,5,6,7
Decimal	10	0,1,2,3,4,5,6,7,8,9
Hexadecimal	16	0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F

Then:

1. Perform the selected conversion manually using arithmetic operations and loops. Built-in format specifiers such as `%x`, `%o`, `%b` are not allowed.
2. Append the following lines to the `collatz.txt` file:

```
Decimal : <last_number>
<Conversion_Name>: <converted_value>
```

3. Also print both lines to the screen.

Note: You must not use arrays or strings. Digits must be printed in reverse using arithmetic and loops.

Example Interaction

```
Enter the starting number of the Collatz Sequence: 10
Enter how many terms to generate: 7

Generated Collatz Sequence:
10
5
16
8
4
2
1

Last number in sequence: 1

Choose a conversion:
1. Decimal to Binary
2. Decimal to Hexadecimal
3. Decimal to Octal
Your choice: 1

Decimal : 1
Decimal to Binary Conversion: 1
```

File: collatz.txt

```
10
5
16
8
4
2
1
Decimal : 1
Decimal to Binary Conversion: 1
```