CSIEB0100 Data Structures

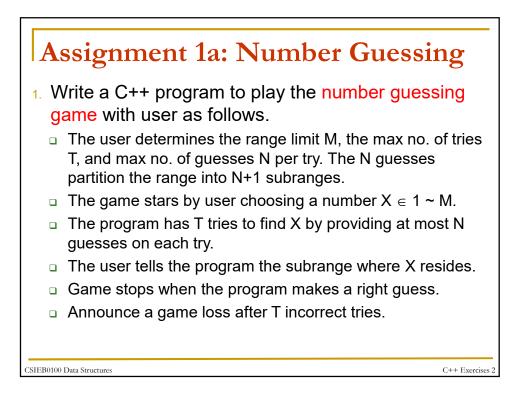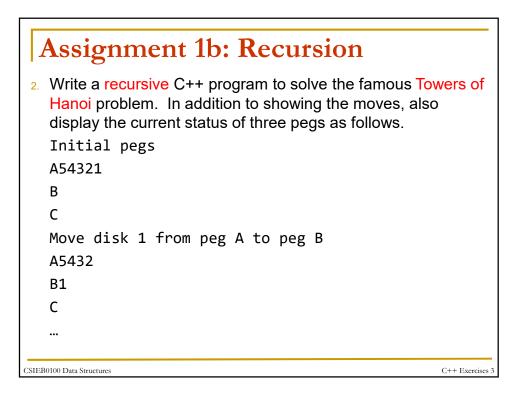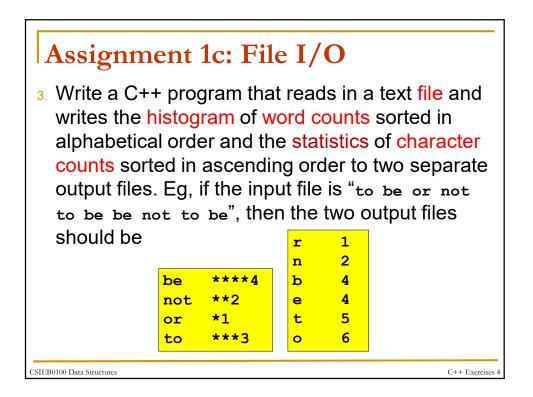# Assignment 1: C++ Exercises

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Assignment 1a: Number Guessing

1. Write a C++ program to play the number guessing game with user as follows.
   - The user determines the range limit M, the max no. of tries T, and max no. of guesses N per try. The N guesses partition the range into N+1 subranges.
   - The game stars by user choosing a number $X \in 1 \sim M$.
   - The program has T tries to find X by providing at most N guesses on each try.
   - The user tells the program the subrange where X resides.
   - Game stops when the program makes a right guess.
   - Announce a game loss after T incorrect tries.

Note 1

Assignment 1b: Recursion

2. Write a recursive C++ program to solve the famous Towers of Hanoi problem. In addition to showing the moves, also display the current status of three pegs as follows.

```
Initial pegs
A54321
B
C
Move disk 1 from peg A to peg B
A5432
B1
C
…
```

Assignment 1c: File I/O

3. Write a C++ program that reads in a text file and writes the histogram of word counts sorted in alphabetical order and the statistics of character counts sorted in ascending order to two separate output files. Eg, if the input file is "`to be or not to be be not to be`", then the two output files should be

```
be    ****4       r    1
not   **2         n    2
or    *1          b    4
to    ***3        e    4
                  t    5
                  o    6
```

Note 2

Assignment 1d: Exception Handling

4. Write a C++ function float calculate(char, float, float) which takes a char of either '+', '-', '*', or '/' as operator and two floats as operands. The function should return the result of applying the corresponding operator on the operands if all of them are of proper types and values. It should throw a char exception if the operator is unknown and a char* exception if the operator is '/' and the second operand is zero. Write a main program with a loop to test your function repeatedly and handle all possible exceptions. The program should continue normally after proper handling of an exception.

Assignment 1e: Time Measurement

5. Download the magic.cpp program and modify it if necessary. Time the execution of the magic function as we discussed in the class. Display the total time and average execution time for 10, 20, … , 100 iterations on magic squares of sizes 11, 21, 31, 41 and 51 (w/o printing). Based on the performance measurement, what is the complexity of the magic function?

Due date: Oct 19, 2023

Notes about Assignment 1

- This assignment is designed to help you get started with IDE and C++.

- The problems are similar but not exactly the same for each semester.

- You are encouraged to discuss with your classmates, TAs and AI tools.

- But the final version must be done by yourself !!

- Follow the TA's instructions when submitting the assignment.