

Assignment #5



Problem Solving and Programming in C++

Department of Computer Science

Old Dominion University

Background:

Stepwise refinement is a low level design technique in which the programmer writes pseudo-code for what the program is supposed to do in steps, expanding non-obvious steps at each iteration of the process. Eventually, the stepwise refinement will be an almost step by step guideline to the implementation of the program.

Objective:

The main objective of this assignment is to assess students' ability to apply the stepwise refinement process to develop a new algorithm and carry that through to the implementation of the program. Implementation must follow the top-down design approach, where the solution starts by describing the general functionality of a game. Next, more details are provided in successive steps to refine the implementation.

Problem Description:

Assume you are hired by a game developing company to write a new computer game for kids. This company has decided to create a version of mastermind with a few different rules hoping that this new game will be more entertaining. If you are unfamiliar with the original game of mastermind, it will help to know how to play. Here is a link that includes the instructions: <https://www.wikihow.com/Play-Mastermind>

This modified version of Mastermind, that you are required to create, is very much like the original game. The differences between the game are as follows:

- Instead of guessing a pattern of colors, you will be guessing a pattern of numbers
- The user of the program is always a guesser (the computer creates the pattern)
- There is a difficulty associated with the game, the difficulty is equal to the amount of numbers to be guessed, and to the range of number that can be possibly guessed
- The player has 10 turns to guess the pattern regardless of difficulty

There are several steps that you will need to implement:

First ask the player to enter a difficulty (1-10) which indicates how long the pattern will be and the range of numbers to guess. For example, if the difficulty is 4, the length of the pattern will be 4 and the range of numbers will be 1-4, inclusively. Next create a random pattern that the user will guess. For each of the 10 turns, print the current turn and ask the user to guess the pattern. Calculate how many of the guesses are correct and in the correct position. Additionally, calculate how many of the guesses are correct, but not in the correct position. Print these statistics to the screen. If the pattern is guessed perfectly, indicate that the user has succeeded. If the pattern is not guessed within 10 turns indicate that the player has lost.

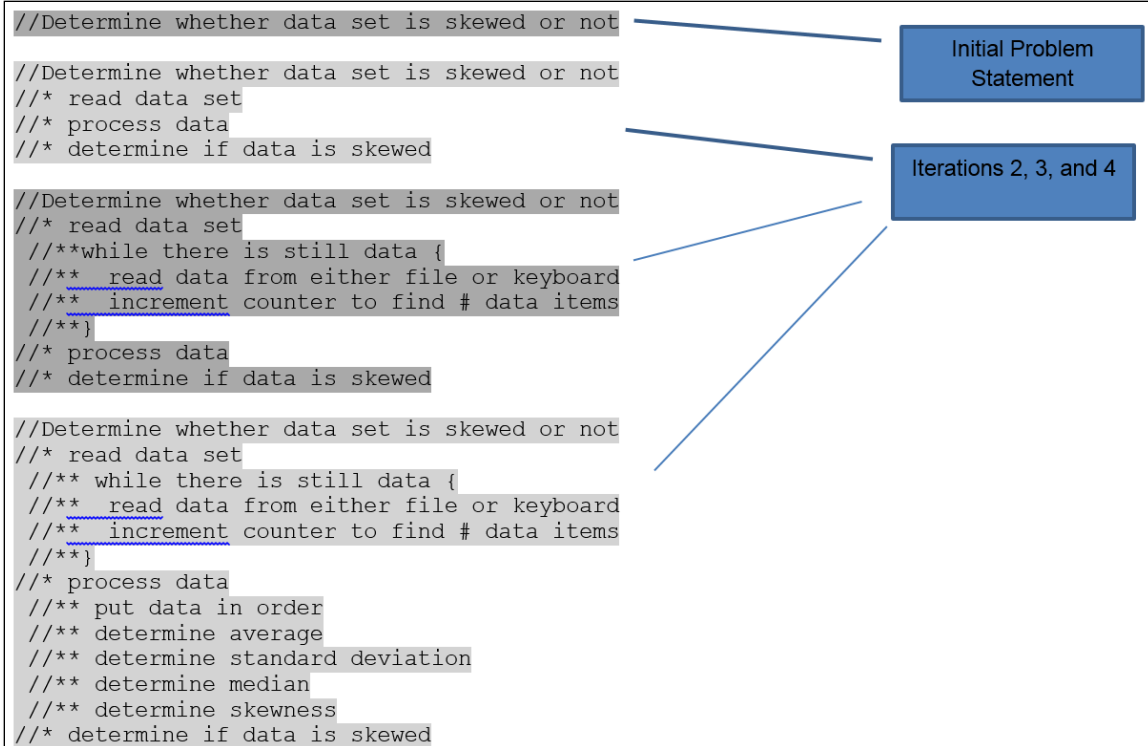
You need to write the stepwise refinement prior to implementing your game so you can show the project manager what you plan to do. You can use the lecture notes to read more about stepwise refinement.

Task:

Your task is to apply the technique of stepwise refinement to design an algorithm for the *playGame()* function and play the game of mastermind.

Help: This assignment requires development of the program using step-wise refinements to write the C++ program which implements the **mastermind game** as described. The game will be played by a human and computer player. Step-wise refinement is a technique used for writing programs. The process starts with a simple statement describing the main functionality of the program. Thereafter, the programmer repeatedly and gradually expands this statement into two or more statements. Next, the new statement(s) is/are repeatedly expanded into more detailed statement(s) with the goal of moving towards the final implementation of your program.

Use a text editor (*e.g.*, the **Code::Blocks** editor or Notepad) to write the first pseudo-code statement of the problem. Next, add more statements that support the implementation of that first pseudo-code statement. Each time you refine a step, copy and paste the current version of the program design to the end of the text file, then make the change within that pasted version. Stick to the instructor's convention of using a different number of ***s** to indicate the level of expansion applicable to each statement (see example below). When the design is complete, the text file will contain a complete record of the design process used to reach the final design. The text file you submit may be quite lengthy and should show the entire process. Do not remove anything and do not just submit the final iteration. Below is a partial example of stepwise refinement (Note it is only a partial example and has nothing to do with the program for this assignment.):



....(this process would be continued until every statement is adequately refined using pseudo-code)

Submission notes:

- Using global variables will result in **-10** points off of your final mark.
- Submit the entire project folder which includes **all files** from your project, especially the **.cpp**, **.h**, and **.cbp** file(s).
- Zip the **project folder** and name it as “**Assg5_cslogin**”, where the **cslogin** is your login ID for the computers at the Department of Computer Science at ODU. (To zip the folder, Right click on it and select “send to” and then click “compressed (zipped) folder”)
- Submit the zipped file to the respective Blackboard link.