EECE 2560: Fundamentals of Engineering Algorithms
Department of Electrical and Computer Engineering

Project #1

In this project, you will write a complete program that allows the user to play a game of Mastermind against the computer. A Mastermind game has the following steps:

1. The codebreaker is prompted to enter two integers: the code length n, and the range of digits m.
2. The codemaker selects a code: a random sequence of n digits, each of which is in the range [0,m-1].
3. The codebreaker is prompted to enter a guess, an n-digit sequence.
4. The codemaker responds by printing two values that indicate how close the guess is to the code. The first response value is the number of digits that are the right digit in the right location. The second response value is the number of digits that are the right digit in the wrong location.

   For example if the code is $1, 2, 3, 4, 5$ and the guess is $5, 0, 3, 2, 6$, the response would be $1, 2$ because one digit (3) is the right digit in the right location, and two digits (2 and 5) are the right digits in the wrong locations.

   Note that no digit in the code or guess is counted more than once. If the code is $1, 2, 3, 4, 5$ and the guess is $2, 1, 2, 2, 2$, the response is $0, 2$. If the code is $3, 2, 3, 3, 3$ and the guess is $1, 3, 3, 4, 5$, the response is $1, 1$.
5. The codebreaker is prompted to continue entering guesses. The codebreaker wins if the correct code is guessed in ten or fewer guesses, and otherwise the codemaker wins.

Your programs should be modular and should make full use of object-oriented programming techniques. Each class should clearly separate its interface from its implementation. Use member functions to implement all commonly used operations. Every function should be documented to describe its function, assumptions and limitations. Each function should validate its inputs and print error messages if the inputs are not correct.

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Part a

In the first part of the project,

1. Implement the class `code` which stores the code as a vector and contains
   (a) the `code` class declaration,
   (b) a constructor that is passed values n and m and initialize the code object,
   (c) a function that initializes the code randomly,
   (d) a function `checkCorrect` which is passed a guess as a parameter, i.e. another `code` object, and which returns the number of correct digits in the correct location,
   (e) a function `checkIncorrect` which is passed a guess as a parameter (i.e. another `code object` and returns the number of correct digits in the incorrect location. *No digit in the guess or the code should be counted more than once.*
2. Implement a function `main()` which initializes a secrete code and prints out the result of calling `checkCorrect` and `checkIncorrect` for three sample guess codes $((5, 0, 3, 2, 6), (2, 1, 2, 2, 2), (1, 3, 3, 4, 5))$. Please print the secrete code as well.