Lab 6 Instructions

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Bulls and Cows

In this lab you will be recreating a game *Bulls and Cows* in which one player creates a secret code, and the other player *guesses* the secret code. In your program, the program will take the role of the player who creates the secret code.

Some starter code is already provided to you in the course repository as well as the sample solution. Your program will receive a codeword as a command line argument, the starter code already sets up this codeword for you in the variable `codeword`, so you do not have to worry about reading command line arguments and simply start writing your program after `codeword` is initialized.

What are Bulls and Cows?

In the game of Bulls and Cows whenever the player who is guessing the code makes a guess they get told how many *Bulls* and how many *Cows* they received. The definition of these is as follows:

- A *Bull* is awarded the player has guessed a correct letter in the correct position
- A *Cow* is awarded the player has guessed a correct letter, but in the wrong position, **and a bull or a cow has not already been awarded for each occurrence of that letter in the codeword**

Example 1

- If the codeword is `hello` and the guess is `bland` then the player is awarded 0 bulls and 1 cow for the letter L that is in the codeword, but in the wrong position in the guess.

Example 2

- If the codeword is `hello` and the guess is `lllll` then the player is awarded 2 bulls and 0 cows. This is because 2 bulls must be awarded for the two letter Ls that are in the correct spot, and that means the remaining Ls cannot be awarded a cow due to there already being an awarded point for each occurrence of L in the codeword.

Example 3

- If the codeword is `hello` and the guess is `llxxl` then the player is awarded 0 bulls and 2 cows. There are 0 bulls because zero characters are in the correct place, and there are only 2 cows because while the guess includes 3 letter Ls, there are only 2 letter Ls in the codeword so once two cows have been awarded for the letter L then they have been awarded for each occurrence of L in the codword, and no more can be awarded for the letter L.

The Program

You must write your Bulls and Cows program so that it has the following behaviour:

- Plays the game of Bulls and Cows, which ends when the player has made 6 guesses or when the player has succesfully guessed the code.
- Each guess the player makes your program should print out how many Bulls and Cows that play
- Continue this until the game is over, either by the player winning the game or losing.

Assumptions

Your program gets to make a few assumptions:

- The codeword will be at least 1 character, and at most 10 characters long
- The guess will always be the exact same length as the codeword
- If your program receives EOF before 6 guesses are made, or the correct guess is made, then it should end early without finishing the game.

Hints

Your program can be written pretty simply by writing a few helper functions. Here are some potential functions you might find handy

- A function that returns the number of times a given character C is in the same spot in the guess and the codeword, i.e. returns how many bulls need to be awarded for a given character in a given guess
- A function that returns the number of times a character appears in a string
- A function that given an index I returns the number of times the character in the guess located at index I occurs in the guess *before* index I, and each of those occurrences don't also appear in the codeword at the same index, i.e. returns the number of cows that occurred for a given character at an index before that index was reached.