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***Substitution Cipher***

Each phase of the program consists of different menus that correlate to menu function that contain user input options to proceed with a new certain function or to just simply quit/stop the program. It should also be noted that almost every phase of the program will prompt the user for authorization before moving forward with its functions; this is to keep the pace of the program at a steady rate, even if it compromises on the ‘simulative’ aspect.

In Menu 0, the program will prompt you to generate a substitution cipher key, that randomly assigns alternate letters to the English alphabet step by step.

Graphical user interface, text

Description automatically generated

From there in Menu 1, the program will prompt you with two different options. The first is to output not only the alphabet but also the new key that corresponds to said alphabet (the key in this program is not outputted by default (and after doing so, the program will just simply redisplay Menu 1).  
  
The alternative option is to move forward is to play the role of Alice by inputting a message for Bob to later receive on his end (for which the program will output back to you, for the sake of assurance)

A screenshot of a computer

Description automatically generated with medium confidence  
  
  
  
  
  
  
It is from here, that you'll be brought to menu 2. In this menu you will be prompted to reassign your message if you so desire to change it, but more importantly you will be prompted to encrypt the message in correspondence with the key that you just randomly generated at the start (for which it well then output that encrypted message to you).  
  
Text

Description automatically generated  
  
From here you'll be brought to Menu 3 where you'll have two important options. The first of these options is to play the role of the recipient, Bob, in which you will decrypt the message using that shared cipher key as a means of reading Alice’s message that was sent to you, for which it will then output the message decrypted and it should be what you as Alice inputted in the first place prior to encryption (it will also bring you BACK to Menu 3 upon completion).

Text

Description automatically generated  
  
The second of these options is to play the role of the attacker, Eve. This will bring you to the ‘Eve menu’.  
  
A screenshot of a computer

Description automatically generated with medium confidence  
From here, you will be brought to the Letter Frequency Analyzer (menu) where you will be prompted to very carefully input the name of your text file that will be scanned. The program recommends that it makes things a lot simpler to have this text file in the same directory as the Python program, so that there is no need to deal with typing out directories.  
In my particular case, my text file is called “big\_text.txt”  
  
Graphical user interface

Description automatically generated with medium confidence

My example specifically uses a text file that contains the words from the first chapter of Project Gutenberg available eBook *Pride and Prejudice.*Which can be found here - - - > https://www.gutenberg.org/files/1342/1342-h/1342-h.htmPrior to pasting it into my text file, it was run through a couple of tools to remove all punctuation and spaces, as well as converting all uppercase letters to lowercase letters.   
Here are the links to those tools:  
https://www.text-utils.com/remove-special-characters/  
<https://convertcase.net/>

The program will (through a series of for loops and some high level functions), store the string contents of the text file in a variable, measure the letter frequency of each letter of the alphabet (with aid of referencing the plain\_text string variable initialized in the beginning), and output a list like so

Text

Description automatically generated