CSCI 1133
Exercise Set 8

You should attempt as many of these problems as you can. Practice is *essential* to learning and reinforcing computational problem solving skills. We encourage you to do these without any outside assistance.

Create a directory named `exercise8` and save each of your problem solutions in this directory. You will need to save your source files in this directory and push it to your repository in order to get help/feedback from the TAs. This requires that you follow a rigid set of naming requirements. Name your individual Python source files using "`ex8`" followed by the letter of the exercise, e.g., "`ex8a.py`", "`ex8b.py`", "`ex8c.py`", etc.

Automatic testing of your solutions is performed using a GitHub agent, so it is necessary to name your source files precisely as shown and push them to your repository as you work.

A. **Letter Frequencies**

Part 1: Write a pure function named `letterFrequency` that will take a string as its only argument and return a Python *dictionary* containing the frequencies of the characters in the string: There should be a single *dictionary* association for each unique character in the list and its associated count. Do not include dictionary associations for characters that do not appear in the string. Do not use any list *methods* in your solution.

Part 2: Write a complete Python program (including a `main` function) that will do the following:

- Solicit a string as input from the user
- Call the function from Part 1 using the input string with all characters converted to lower case and spaces removed
- Print out the characters and their frequencies from the dictionary in lexicographic order

e.g.,

```
Enter a text string:  The cow jumped over the moon
c   1
d   1
e   4
h   2
j   1
m   2
n   1
o   4
p   1
r   1
t   2
u   1
v   1
w   1
```

B. **Telephone Number Lookup**
Write a function named `reverseTel()` that takes a phone book as input, i.e., a dictionary mapping names (the *keys*) to phone numbers (the *values*). The function should return another dictionary representing the reverse phone book mapping phone numbers (the *keys*) to the names (the *values*).

e.g.,

```
>>> phonebook = {'Smith, Jane':'123-4567','Doe, John',:'987-6543,
'Baker,David':'567-8901'}
>>> reverseTel(phonebook)
{'123-4567':'Smith, Jane', '987-6543':'Doe, John', '567-8901':Baker, David'}
```

C. **More Fun with Letter Frequencies**
Modify the function from problem A to output the counts in order of *frequency* (highest first). Maintain lexicographic ordering for characters with identical frequencies. [Hint: this requires creating a "reverse" association in which the frequencies are the *keys* and the *values* are lists/tuples of characters]

e.g.,

```
Enter a text string:  The cow jumped over the moon
e   4
o   4
h   2
m   2
t   2
c   1
d   1
j   1
n   1
p   1
r   1
u   1
v   1
w   1
```

D. **Reverse Phone Spelling Program** (adaped from *Dierbach,* problem D1*, p361*)
Write a Python program that allows a user to enter a phone number containing letters and outputs the corresponding numeric phone number. e.g., 764-HELP is equivalent to 764-4357.

Your program must do the following:

- Use a Python *dictionary* to perform the letter-to-number conversion.
- Input phone numbers must have either 7 or 10 "digits" (numbers *or* letters) and can be input in upper or lower case using any or no punctuation: e.g., '612.GOT#MILK', '(612) GOT MILK', '612gotMilk', and '612 GOT MILK' are all valid inputs.
- Validate the input to ensure it contains the correct number of "digits"
- Output the converted phone number using hyphen characters in one of the following forms as appropriate:
  `nnn-nnn-nnnn`
  `nnn-nnnn`
- Continue converting telephone numbers until the user enters a null string.

Constraints:

- Do not import/use any library modules.

Examples:

```
Enter a telephone number(press enter to quit): 612.got.milk
Numeric telephone number is: 612-468-6455
Enter a telephone number(press enter to quit): 612.not.milky
Invalid number!
Enter a telephone number(press enter to quit): Voo doo Dude
Numeric telephone number is: 866-366-3833
Enter a telephone number(press enter to quit): got#milk
Numeric telephone number is: 468-6455
Enter a telephone number(press enter to quit):
```