Assignment 9

CS161

For each of the problems below be sure to design your solution before you write any Python code. Follow the software development stages:

1. Analyze the problem
2. Determine the specifications for your solution
3. Create a design for your solution in pseudocode
4. Implement your design in Python
5. Test/debug your solution

Each Python module you turn in must begin with a block, called a *docstring*, that looks like the example below (see PEP 257 for more details). The module docstring must follow the shebang and coding statements in your module; i.e. it must be the first actual line of code in the module.

In your module docstring show the work you did following the software development stages above. Make notes about the problem as you analyze it; write specifications for what your program must do to find a solution; write your program out in pseudocode *before* you start to write Python; and design a set of test data that you can use to prove your program is producing correct results. Only after you've done all of this should you try to translate your pseudocode to Python.

```
#! /usr/bin/env python3
# coding=utf-8

"""
Brief, prescriptive, one sentence description of what the module does.

A more detailed explanation of what the module does. Use complete sentences and
proper grammar. Treat this as if it is documentation someone else will be reading
(because it is). Include any notes from your problem analysis as well as your
program specifications here.

Pseudo code, to be written before any actual Python code.

Assignment or Lab #

Firstname Lastname
Firstname Lastname of partner (if applicable)
"""
<two blank lines>
<your code>
```

Every function or method you write must also include its own docstring. That header will also use triple quotes and begin with a prescriptive, one sentence description of what the function or method does. If the function or method takes arguments, they should be described as well as any non-obvious return value(s). See examples below or PEP 257 for more details).

```
def print_greeting():
    """Print a greeting to the user."""
    print(“Hello out there in userland!”)


def hypotenuse(side_a, side_b):
    """
    Calculates the length of the hypotenuse of a right triangle using
    the formula c^2 = a^2 + b^2.

    side_a – the length of side A of the triangle
    side_b – the length of side B of the triangle
    """
    c = a**2 + b**2
    return math.sqrt(c)
```

Pair Programming

In this assignment we are going to use **pair programming**.

> *Pair programming is an agile software development technique in which two programmers work together at one workstation. One, the **driver**, writes code while the other, the **observer** or **navigator**, reviews each line of code as it is typed in. The two programmers switch roles frequently.*
>
> *While reviewing, the observer also considers the "strategic" direction of the work, coming up with ideas for improvements and likely future problems to address. This is intended to free the driver to focus all of their attention on the "tactical" aspects of completing the current task, using the observer as a safety net and guide.*

Choose one partner in the lab to work with. You can pair program in one of two ways:

1. Two people can work at one computer, occasionally switching the driver and observer roles. It is *critical* that both members be engaged in the work. You should take turns being in the driver and observer roles with only the driver typing and the observer making comments or driving the direction of the code.
2. Two people can work at separate machines using Visual Studio Live Share. Live Share, available as a free plug-in for VS Code and already installed on the school’s Surface devices, enables you and your partner to collaborate on the same codebase without the need any difficult configuration. When you share a collaborative session, your partner sees the context of the workspace in their editor. This means they can read the code you shared without having to clone a repo or install any dependencies your code relies on. They can use rich language features to navigate within the code; not only just opening other files as text but using semantic analysis-based navigation like Go to Definition or Peek. Again, you should take turns being in the driver and observer roles with only the driver typing and the observer making comments or driving the direction of the code.

Assignment

For the assignments below you may use *any* GUI library you like. There are many of them to choose from.

1. Credit card numbers follow a standard system. For example, Visa, MasterCard, and Discover Card all have 16 digits and the first digit serves to indicate the card brand. All American Express cards start with a 3; Visa cards start with a 4; MasterCard cards always starts with a 5; and Discover cards start with a 6. Further, the Lhun Algorithm, as described here, is used to check whether a set of 16 digits can be a valid credit card number.

   Write a GUI program that prompts for a credit card and determines if it could be a valid. Your program should print a message telling the user if it is or not, and in the case that it is, prints the name of the brand and its logo. If the card brand cannot be determined but the number appears to be valid the program should output "Unknown Card."

   Save your program in a file named `credit_card.py`.

2. Phone numbers in the US consist of 10 digits, sometimes formatted with punctuation. Write a program that prompts for a phone number, and determines whether or not it is a valid 10-digit number by ignoring any punctuation. Since this is a non-GUI program the user should be able to provide the number as an argument on the command line or, if no number is given, the program should prompt for one.

   Save your program in a file named `phone.py`.

3. In the game of Scrabble, players score points determined by the words they put on a board. Each letter is assigned a certain value, and the word score is the sum of the letter values. Write a program that allows the user to evaluate the score of any word. For this exercise, assume that the value of any character is the ord() value minus 97; and also your program should consider only the lowercase version of the given word. Finally, your program must use a sentinel loop to allow the user to evaluate as many words as they would like, until they enter the word "quit."

   Save your program in a file named `scrabble.py`.

4. Write a GUI program that asks the user to guess a random number between 1 and 100, inclusive. The program should end when the user guesses correctly, but otherwise provides hints in the form of a graphical arrow and text for guessing higher or lower.

   Save your program in a file named `guessing_game.py`.

Submission

Submit all your Python script files, and any other necessary files, in the appropriate folder in Google Drive as demonstrated by your instructor.