CMPS 1500 Introduction to Computer Science I – Spring 2019

Lab 3
Due **Wednesday 2/13/19** at 11:59 p.m. on Zybook and Canvas
You may work in a pair.

Lab guidelines: Complete the problems below. Submit the programming problems to Zybook for grading, and the text response to Canvas. Each program should be placed in its own file, named exactly as specified.

Your submission must be your work, and only your work. You are encouraged to work on all problems with a partner, according to pair programming rules outlined in the syllabus: both of you will submit the same program (in the header docstring you should list your partner's name) and both of you will receive the same grade. You should work on one computer in the same physical location and collaborate on all problems in the homework; splitting up work is not permitted.

All program files should contain header docstrings with name(s) of program author(s), creation date, and a brief explanation of the program, as well as in-line comments explaining what your code does.

Note a slightly different format for testing and submitting your code to Zybook. The code files that you submit for the first two problems should only contain function descriptions, nothing else (no module imports, no input() or print() or other statements other than function descriptions).

0. Health statistics, `lab3pr0.py`

   Write a program that estimates the approximate number of times the user's heart has beat in his/her lifetime using an average heart rate of 72 beats per minute and estimates the number of times the person has yawned in his/her lifetime using an average of 5 yawns per day. The program should have two functions, `heartbeats(age)` and `yawns(age)`, that take age in years as an input parameter and returns the estimated number of heartbeats and the number of yawns, respectively. In your computation ignore leap years. The code of your main program should be as follows:

   ```
   age = int(input("Enter your age in years: "))
   print(heartbeats(age), "heartbeats and", yawns(age), "yawns so far")
   ```

   Carefully test the program. For submission, only copy the code for the functions into Zybook (please don't include the main program).

1. Pizza analysis, `lab3pr1.py`

   You noticed that the menu of your favorite pizza chain store is rather complicated. They offer a range of pizza size and price options, making it difficult to see what option offers the most pizza for your dollars. So you decide to write a program that calculates the cost per square inch of a circular pizza, given its diameter and price, similar to how grocery stores display cost-per-ounce prices. The formula for area is $A = r^2 * \pi$, where r is the radius.

You have to use two functions: one called `area(radius)` to compute the area of a pizza, and one called `cost_per_square_inch(diameter, price)` to compute cost per square inch. Sample runs of your program should look similar to this:

```
Please enter the diameter of your pizza, in inches: 20
Please enter its cost, in dollars: 20
The cost is 0.06 dollars per square inch.
>>>>
Please enter the diameter of your pizza, in inches: 8.5
Please enter its cost, in dollars: 12.99
The cost is 0.23 dollars per square inch.
```

Use the built-in Python function `round(value, 2)` to round the final cost-per-square-inch value to two decimal points. Use `import math` and `math.pi` to get the value of pi for area computation.

2. License plate generator, `lab3pr2.py`

   License plates in Louisiana consist of six characters, starting with three letters that are followed by three numbers. In this problem we consider a license place format that is a bit more general.

   In this problem, license plates consist of 6 characters. For a given number `num_letters`, a license plate has to start with exactly `num_letters` upper-case letters. The remaining `6-num_letters` characters have to be numbers (digits from 0 to 9). Example license plates are:

   ```
   883888 B38838 CS4242 ABC123 NOLA19 SAINT1 TULANE
   ```

   Note that for the examples above, `num_letters` ranges from 0 to 6. You can assume that `num_letters` is a value between 0 and 6 (inclusive).

   Your task is to write a function `licensePlate(num_letters)` which returns a random license plate that has the required format.

   Use the module `random` and the function `random.choice` to make (pseudo-)random choices. Please make sure to use `import random` to import the module.

3. **Games for good**, `lab3pr3.txt`

   Watch the talk by Bob De Schutter "How games are changing the way we age " (8 minutes):

   ```
   https://www.youtube.com/watch?v=ZfU6DGfhWt8
   ```

   As you can see from the talk, computer games that were initially developed as pure youth entertainment, have now found "practical" uses in several unexpected areas, such as providing medical rehabilitation to stroke patients. Using Internet search and your imagination, discover the cases in which computer game software and gaming hardware (such as Wii remote, Kinect), are used to achieve a goal other than entertainment. One notable example is the FoldIt project, but there are many more areas where computer games have brought advances. You can

talk about existing cases, or you can envision and predict potential applications of gaming technology in other areas of life. In your answer, provide at least 3 examples (max is 7), with a 2-4 sentence description for each case.

For your answer you are welcome to consult any source you find credible, including internet sites and forums, family members, friends outside of class, your class colleagues, etc. Of course you may complete the answers on your own or with your partner. There is no one right answer.