

CS 350 Quiz 1: Take-home

1. (15 pts.) In the in-class portion of this test, you were asked to do the following:

In this problem you will design a class hierarchy in Python. Please address each of the following taking care to identify your answers.

- Describe the class definitions for a hierarchy of classes: sphere, ball, soccer ball. Tell where you would place the following attributes in your hierarchy: manufacturer, radius, usage (e.g., which sport), volume, and price.*
- What general properties would a sphere and a soccer ball have in common? How would you deal with these properties?*
- If you wanted to distinguish between inflatable balls (e.g., soccer balls and basket balls) and solid-core balls (e.g., baseballs and golf balls), how would you incorporate this into your design?*

Implement your design and demonstrate its use. (You may modify your original design.)

2. (15 pts.) Write and demonstrate the following in Python:

- A function `replace()` that take three string arguments and returns a new string. The function should replace all occurrences of the second string in the first with the third string. For example, `replace("one step two step", "step", "tap")` should return `"one tap two tap"`.
- A function `edit()` that takes a string and a dictionary. It should then call `replace()` with the string and each `key:value` pair in the dictionary.

3. (5 pts.) Using `map()` and `lambda()`, write code to find the square root of a list of numbers. The list may contain both positive and negative numbers.

4. (10 pts.) Matrices (tables of numbers) are easily represented in Python as lists of lists. For example, this table could be represented as `[[2, 3, 4], [0, -2, 1]]`.

2	3	4
0	-2	1

Write a function that will add the items in two matrices in a pair-wise manner. Since this operation is not defined if the tables have different shapes, your code should check for this. Here is an example of adding the two tables:

$$\begin{array}{|c|c|c|} \hline 2 & 3 & 4 \\ \hline 0 & -2 & 1 \\ \hline \end{array} + \begin{array}{|c|c|c|} \hline 3 & 0 & 1 \\ \hline -5 & -2 & 4 \\ \hline \end{array} = \begin{array}{|c|c|c|} \hline 5 & 3 & 5 \\ \hline -5 & -4 & 5 \\ \hline \end{array}$$

5. (5 pts.) Write a Boolean function `LeapYear()` that takes a year as an argument and returns `True` if it is a leap year and `False` otherwise.