

# CS 515 Homework 9

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**Homework 8: Final Review**

**Due: 5/4/22 at 11:59pm**

**Please submit this homework as a single file containing all functions, called hw9.py**

## Introduction

This homework will be a collection of a variety of different types of problems that will be on the final exam.

## 1 Question 1: The Max of Rows and Columns

Implement the method `twoMaxes(L)` which takes in a **two-dimensional** list `L` and returns a list of lists. The list you return should have two elements. The first element is the max of each row, and the second element is the max of each columns.

```
>>> inputList = [[1,2],[3,4]]
>>> L = twoMaxes(inputList)
>>> print(L)
[[2, 4], [3, 4]]
```

## 2 Question 2: Accumulate in a Dictionary

Write the method `dictionaryCollector(L)` which takes in a list `L` and returns a dictionary. The dictionary has two keys, `'int'` and `'string'`, and they have the following values. `'int'` contains the sum of all elements in the list `L` and `'string'` has the value of all of the strings in `L` concatenated **IN-ORDER**. Values of all other types in `L` should be ignored.

```
>>> L = [True, 1, 4, 5, 'hello', 10, '10', 'world']
>>> d = dictionaryCollector(L)
>>> print(d)
{'int': 20, 'string': 'hello10world'}
```

### 3 Question 3: Write a recursive separator

Write the method `separateNumbers(L)` that takes in a list of numbers `L` that returns two lists, the first one contains the odd numbers from the list and the second one contains the even numbers. This function **MUST** be written recursively.

```
>>> inputList = [1,2,3,4,5,6,7,8,9,10]
>>> L = separateNumbers(inputList)
>>> print(L)
[[1, 3, 5, 7, 9], [2, 4, 6, 8, 10]]
```

### 4 Question 4: Subclasses

Please write two classes, `Circle` and `Sphere`. `Sphere` should be a subclass of `Circle`. Both classes have just one instance variable, `radius`. When giving the object to print, it should print `Radius: R`, where `R` is the actual radius. All radiuses will be ints. `Circle` should have three methods: `__init__`, `__str__`, and `area`. `Sphere` should have four methods `__init__`, `__str__`, and `area`, and `volume`. Inheritance should be used where possible. Note for `Circle`, the `area` method should calculate the area and for `Sphere` `area` should calculate surface area. Please use `math.pi` for the value of pi. I will be checking equality to two decimal places.

```
>>> c = Circle(3)
>>> s = Sphere(4)
>>> print(c)
Radius: 3
>>> print(s)
Radius: 4
>>> print(s.area())
201.06
>>> print(s.area())
201.06
>>> print(s.volume())
268.08
```

## 5 Question 5: Write a precise division function

Write the method `preciseDivision(a,b)` which takes in two values, `a` and `b` and attempts to do `a/b`. If there is division by 0, return `float(math.inf)`. If there is any other error, return `None`. Otherwise, just do the division as normal.

**Again, please submit this homework as a single file containing all functions, called `hw9.py`**