CSC 110 – Lab 3
More Algorithms using Python

Names: _____

Introduction
The purpose of this lab is to continue to practice writing simple algorithms and implementing them in Python.

Exercises

For the exercises that follow, be sure that you save your programs with a .py extension so that it is recognized as a Python module.

1) Suppose you work for a company that measures building vibrations using sensors attached to the building. These vibrations are measured in terms of acceleration (m/s**2). Over the course of a day, you collect n readings periodically. But we are only concerned with readings that are above a specified threshold. Write an algorithm that counts how many of the readings exceed the threshold. Your algorithm will ask the user for the number of readings (n) and the threshold. The user will input the readings into a list to be processed.

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2) Assume that you work for the telephone company and you are trying to find out the total number of calls made in a region. The region is divided into 4 calling districts 0, 1, 2, and 3 and the phone company keeps track of the number of calls placed from one district to another, and the number of calls placed within a district. The information is recorded in a table as shown here:

	0	1	2	3
0	243	187	314	244
1	215	420	345	172
2	197	352	385	261
3	340	135	217	344

where the entry in row 1, column 2 indicates the number of calls made from district 1 to district 2, etc.

We are going to write an algorithm that prints the table and computes the total number of phone calls made.

Let's do this step by step. First, let's look at how to get the data into the table. A 2-dimensional table like this can be thought of as a list of lists. So in Python, this list would look like this:

```
phoneCalls = [[243, 187, 314, 244], [215, 420, 345, 172], [197, 352, 385, 261], [340, 135, 217, 344]]
```

So `phoneList[0]` is the list `[243, 187, 314, 244]`, etc.

To add items to a 2D table like this, you will build each of the inside lists, and then add them to the outside list.

Write the Python code to build one of the inside lists assuming that there are 4 districts for which you are keeping track of calls. Get a signature from an instructor when you are finished with this.

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Now since you have the code to get ONE of the inner lists, you can use a loop to do this 4 times (once for each row in the table). Put in a print statement to print your list to make sure that it has gotten all of the data. When you have this done, get instructor initials.

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Now that you have entered the data into the 2D list (or list of lists) now you can process the data to compute the total number of calls. Recall from the video lesson that in order to access the element of the table in the ith row and jth column, you use the notation:

```
phoneCalls[i][j]
```

Let's start by finding the total number of calls made by the first district. This will have you adding

```
phoneCalls[0][0] + phoneCalls[0][1] + phoneCalls[0][2] + phoneCalls[0][3]
```

Of course, you will want to use a loop to do this so that your program can be easily modified if we have more than 4 districts.

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Now that you have the total number of calls for the FIRST district, modify your code so that it computes the total number of calls for ALL of the districts. Again, you will want to use a loop to do this so that you code is general enough to work for any size 2D list.

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Challenge Problems

You must complete Problems 1 & 2 and have the TA or instructor approve them before proceeding to Problems 3 & 4.

3) Write an algorithm that finds all of the prime numbers between 1 and a given positive integer n.

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4) Write an algorithm that is given as input a list of numbers and the result is the same numbers stored in the same list in reverse order. After reversing the numbers in the list, print out the updated list. You can assume that you also are given the number of numbers in the list. While it is possible to do this by creating a second list, see if you can write the algorithm so that it does not need to use another list to create the result. That is, reverse the numbers using the existing list.

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