In this homework assignment you will use determine the Phi Coefficient for the groundhog not seeing its shadow and an early spring, where early spring is as we defined in homework 3.

You will write at least three functions:

```
def readSpring(filename):

def readGround(filename):

def calculatePhi(springList, shadowTable):
```

The readSpring function takes in a text list of years for which there is an early spring. (The output of your last homework.) The function returns a list of integers (The file is provided).

The readGround takes in the name of the Kaggle data text file recording whether or not the ground hog saw its shadow (File is provided). The first few lines of this file are detailed below:

```
Year Punxsutawney Phil
1886 No Record
1887 Full Shadow
1888 Full Shadow
1889 No Record
1890 No Shadow
```

The first line will be ignored. You will need to be mindful that some years have “No Record”. You will also need to be mindful of the split function on this data.

The readGround function will return a dictionary. The dictionary will have integer keys which are the year in question. If the groundhog saw it shadow (“Full Shadow”) then the dictionary stores true for that year. If the groundhog did not see it shadow then the dictionary stores false. A year that has “No Record” is not stored in the dictionary.

The calculatePhi function calculates Pearsons Phi Coefficient a measurement of the correlation of two binary variables. (https://en.wikipedia.org/wiki/Phi_coefficient). This function takes in a list of years that had an early spring, and a dictionary of whether or not the groundhog saw it shadow.

To calculate this you have four possible scenarios:

Correct 1 (c1): The groundhog saw its shadow and there was no early spring
Correct 2 (c2): The groundhog did not see its shadow and there was an early spring

Incorrect 1 (i1): The groundhog saw its shadow and there was an early spring
Incorrect 2 (i2): The groundhog did not see its shadow and there was no early spring.

The formula for Phi is then:

(c1 * c2 - i1 * i2) / sqrt( c1*c2*i1*i2)

Here sqrt is the square root function. To calculate square root in Python you can use the math library.

First you must import it, at the top of your program you have the line

```
import math
```

Then to use it:

```
x = math.sqrt(y)
```

Turn in one file with these three functions to Gradescope.