MR2020 Worksheet/Homework 2: Module Imports, Functions, Classes, List Comprehensions

<u>Due August 13.</u> This worksheet blends some of the newest material with some of the basics from the first worksheet.

Declaring functions

1. Define a function called "Ttotheta". The function has two input variables: *T* and *p*. The purpose of the function is to convert temperature to potential temperature (denoted by the Greek letter theta, or θ), which can be done using the following equation:

$$\theta = T * \frac{p_0^{R_d/c_p}}{p}$$

in which p_0 = 1000, R_d = 287, and c_p = 1004 are constants and can be used as global variables. .

Your function should use the two inputs *T* and *p* and assign the three constants to calculate and return θ as output.

```
def Ttotheta(T,p):
    """
    Inputs:
    pressure in hPa.
    temperature in K.
    Outputs:
    potential temperature in K.
    """
    p00, Rd, cp = 1000, 287, 1004
    return T*(p00/p)**(R/cp)
```

2. Define a class called BuoyOb.
    a. Initialize an object in this class with the following variables: *T, SST, p, RH*, and *S* which could correspond to air temperature, sea surface temperature, pressure, relative humidity, and salinity.
    b. The class should contain one method that converts the air temperature to potential temperature. You can take the function that you wrote in Question #1 and adapt it to the BuoyOb class to create an attribute called *theta*.
    After you class is defined, create an object called "ob" and assign it an air temperature of 287, sea surface temperature of 285, pressure of 998, relative humidity of 70, and salinity of 34.

```python
class BuoyOb():
    def __init__(self,T,SST,p,RH,S):
        self.airtemp = T
        self.SST = SST
        self.pres = p
        self.RH = RH
        self.salinity = S
    def Ttotheta(self):
        p00, Rd, cp = 1000, 287, 1004
        return self.airtemp*(p00/self.pres)**(Rd/cp)

ob = BuoyOb(287,285,998,70,34)
```

3. Write a line of code that imports the method "pyplot" from the module "matplotlib". Write this code so that you can call "pyplot" using the alias "plt".

```
from matplotlib import pyplot as plt
```

or

```
import matplotlib.pyplot as plt
```

4. Write a line of code that imports the module "pandas" so that it is accessible using the alias "pd".

```
import pandas as pd
```

5. Another way to simulate flipping a coin is to import the "choice" method from the "random" module. The output of

    choice(['Heads','Tails'])

    simulates a coin toss. Write a python code that uses this function to simulate flipping a coin 1000 times and store the results of all coin flips in a variable called "flips". Your answer may only be 2 lines long, including the module import.

```
from random import choice
flips = [choice(['Heads','Tails']) for i in range(1000)]
```