PSTAT160ASpring2020 Python HW 3

April 30, 2020

1 Python Homework 3

Release date: Friday, April 17th **Due date:** Friday, **May 1st**, 11:59 p.m. via GauchoSpace

Instruction: Please upload your pdf or html file with your code and result on GauchoSpace with filename "PythonHW3_YOURPERMNUMBER.ipynb".

In this Python Homework you are asked to implement two simulations related to problems discussed in class.

As usual, start with loading some packages:

[5]:

```
import numpy as np
```

1.1 Problem 1 (5 Points)

Since the beginning of Spring quarter Julie goes every day to Woodstock Pizza, orders a slice of pizza, and picks a topping - pepper, pepperoni, pineapple, prawns, or prosciutto - unifromly at random.

1. Implement a simulator which uniformly samples from one topping:

[6]:

```
# uniform samples from one topping
from enum import Enum
from random import randint

class Topping(Enum):
    pepper = 1
    pepperoni = 2
    pineapple = 3
    prawns = 4
    prosciutto = 5

def simulation():
    num = randint(1, 5) # randomly generate a number from 1 to 5 to simulate␣
 ↪toppings
    return Topping(num) # return the selected topping
```

2. On the day that Julie first picks pineapple, find the empricial mean of the number of prior days in which she picked pepperoni by running 10000 simulations.

[7]:

```
# running 10000 simulations

def julie_select_pepperoni():
    # calculate numbers of time julie select pepperoni before pineapple
    number = 0
    # run simulation for 10000 times
    for i in range(10000):
        topping = simulation()
        # run the simulation till julie gets first pineapple topping
        while topping != Topping.pineapple:
            if topping == Topping.pepperoni:
                number += 1
            topping = simulation()
    mean = number / 10000
    return mean

print("The mean is: ", julie_select_pepperoni())
```

```
The mean is:  0.9999
```

1.2 Problem 2 (5 Points)

Recall Problem 3.3:

A health insurance will pay for a medical expense subject to a USD 100 deductible. Assume that the amount of the expense is exponentially distributed with mean USD 500.

Compute the empirical mean and emprical standard deviation of the payout by the insurance company by using 100000 samples.

[8]:

```
# empirical mean and emprical standard deviation
import numpy

expense_amount = numpy.random.exponential( size = 100000, scale = 500)
# Subtract 100 USD 100 from the expense
for i in range(len(expense_amount)):
    expense_amount[i] -= 100
mean = numpy.mean(expense_amount)
standard_deviation = numpy.std(expense_amount)

print("mean is", mean )
print("standard deviation", standard_deviation)
```

```
mean is 398.98121787846566
standard deviation 497.6292559997134
```