hw2_pt2

January 28, 2025

1 Homework 2

(Total: 50pt)

This is an individual assignment. Related knowledge: - Conditional probability - Chain rule - Total probability theorem - Bayes theorem

```
[1]: import random
     import numpy as np
     import math
```

1.1 Problem 1

(20 pt)

Implement a function to evaluate the relative frequency of a batch being accepted if it contains k defectives.

A batch of one hundred items is inspected by testing five randomly selected items. If one of the five is defective, the batch is rejected. What is the probability that the batch is accepted if it contains four defectives?

```
[ ]:
```

1.2 Problem 2

(20 pt)

Suppose you have an assortment of coins: 61 coins each with probability of flipping heads p, in the interval $[0.2, 0.8]$, defined below:

```
[2]: import numpy as np
     allcoins = np.linspace(0.2,0.8,61)  # set of coins

     allcoins
```

```
[2]: array([0.2 , 0.21, 0.22, 0.23, 0.24, 0.25, 0.26, 0.27, 0.28, 0.29, 0.3 ,
            0.31, 0.32, 0.33, 0.34, 0.35, 0.36, 0.37, 0.38, 0.39, 0.4 , 0.41,
            0.42, 0.43, 0.44, 0.45, 0.46, 0.47, 0.48, 0.49, 0.5 , 0.51, 0.52,
            0.53, 0.54, 0.55, 0.56, 0.57, 0.58, 0.59, 0.6 , 0.61, 0.62, 0.63,
            0.64, 0.65, 0.66, 0.67, 0.68, 0.69, 0.7 , 0.71, 0.72, 0.73, 0.74,
```

```
        0.75, 0.76, 0.77, 0.78, 0.79, 0.8 ])
```

Consider the experiment where you pick a coin at random and flip it 6 times, and the event "all tails" occurs.

What is the probability that the coin has a probability of tail smaller than 0.5?

Implement simulation to evaluate the relative frequency

```
[ ]:
```

1.3 Problem 3

(10 pt)

Consider the experiment where you select one card at a time, at random and without replacement, from a playing 52-card deck (13 cards per suit).

Let S_i be the event that a spade is the ith draw from the deck.

Implement simulation to estimate the relative frequency of $P(S_2)$. (**Hint** : use `random.shuffle` to simulate)

```
[ ]:
```

2 Submit Your Solutions

Confirm that you've successfully completed the assignment. submit both the notebook files and a PDF printout