Due: April 19, 2019

Groups of size 2 Please! Turn in written work in gradescope and code via handin (see syllabus for code requirements)

Homework 1

Problem 1. (Matloff)

Consider the board game example (but with no bonus rolls). We will be interested in the quantities t_{ik}, i = 0,1,2,4,5,6,7, the probability that it takes k turns to reach or pass square 0, starting at square i.

Write a recursive function pik(i,k) that returns t_{ik}. For instance,

```
> pik(3,2)
[1] 0.5
> pik(4,4)
[1] 0.00462963
> pik(1,2)
[1] 0.5833333
> pik(0,2)
[1] 0.4166667
> pik(7,1)
[1] 1
> pik(7,2)
[1] 0
> pik(5,3)
[1] 0.02777778
> pik(5,2)
[1] 0.3055556
> pik(4,4)
[1] 0.00462963
> pik(4,3)
[1] 0.0787037
```

Problem 2.(Matloff)

Consider the ALOHA example. Suppose it is known that $X_1 = X_2$. Find the probabilities that there were 0, 1 or 2 collisions during those two epochs. Show your answer via simulation in R by augmenting the code from the book.

Problem 3.

Suppose we deal a 5-card hand from a regular 52-card deck. Which is larger, P(1 ace) or P(3 diamonds)?

Before continuing, take a moment to guess which one is more likely

Please show both the equation and use R to solve and provide actual probabilities.

Problem 4.

Step 1: Generate a random integer between 3 and 6. Set A to be the value of the generated number.
Step 2: Generate a random integer between 3 and 6. Set B to be the value of the generated number.

You are running a camp of 30 students, including John and Jane.

3a.) What is the total possible ways you can arrange 2 focus groups of students one group being size A(from step 1), and the other size B.

3b.) What is the probability that John and Jane are not in the same group (so either not chosen or are chosen but not in the same group).

Problem 5.
You are a doctor. You have a medical test that given a person has cancer the test sees a high (X=true) level of protein X in 95% of patients.
Given the person is Healthy the test sees the protein X as high(X=true) in 10% of patients.

Additionally it is known that only 1% of the population is found to have cancer when a screening is performed.

A new patient with high levels of protein X wants to know how probable it is for him to have cancer.

Hint (Bayes Theorem)