**IT-223 Assignment #6**

**Problem #1**(10 points)

You ask your graduate student to roll a die 10,000 times and record the results.

1. Give the probability model, expected mean and standard deviation of the outcome.
2. The die roll experiment is repeated (though with a different graduate student – for some reason your previous student went to work with a different advisor). However in this case, the die is weighted so that a 6 shows up 20% of the time and all remaining numbers show up 16% of the time. Now what is the mean and sd of 10,000 rolls? Be sure to give the probability model, expected mean and standard deviation of the outcome

**Problem #2**(12 points)

In a college population, students are classified by gender and whether or not they are frequent binge drinkers. Here are the probabilities:

|  |  |  |
| --- | --- | --- |
|  | Men | Women |
| Binge Drinker | 0.11 | 0.12 |
| Not Binge Drinker | 0.32 | 0.45 |

**(a)** Find the probability that a randomly selected student is a male binge drinker, and find the probability that a randomly selected student is a female binge drinker.

**(b)** Find the probability that a student is a binge drinker, given that the student is male and find the probability that a student is a binge drinker, given that the student is female.

**(c)** Your answer for part (a) gives a higher probability for females, while your answer for part (b) gives a higher probability for males. Interpret your answers in terms of the question of whether there are gender differences in binge-drinking behavior. Decide which comparison you prefer and explain the reasons for your preference.

**Problem #3**(7 points)

Call a household prosperous if its income exceeds $225,000. Call the household educated if the householder completed college. Select an American household at random, and let *A* be the event that the selected household is prosperous and *B* the event that it is educated. According to the Current Population Survey,*P*(*A*) = 0.122, *P*(*B*) = 0.204, and the probability that a household is both prosperous and educated is *P*(*A* and *B*) = 0.074. What is the probability *P*(*A* or *B*) that the household selected is either prosperous or educated?

**Problem #4**(6 points)

You are a high-school basketball coach and the final game of the season is on the line. You must pick one of the following two players to make 3 free-throw attempts. Here are the current season’s outputs for your two best shooters, Lauren and Lisa. Which one is most likely to give you your best result?  Be sure to explain why.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lauren** | 0 | 1 | 2 | 3 |
| Prob. | .3 | .2 | .2 | .3 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lisa** | 0 | 1 | 2 | 3 |
| Prob. | .1 | .4 | .3 | .2 |

**Problem #5** (5 points)

The cartoon on the opening slide of this week’s lecture demonstrates the famous ‘Monty Hall Problem’. This is a famous statistical puzzle. Go online and read up on the game and explanations on why the user should switch. Then describe why the user should decide to switch doors.

A key point to remember is that the game host is required to pick a door behind which is a goat. That is, the host will never pick the winning door.

This problem is very interesting for all kinds of reasons, one of which is the fact that intuitively, most people (including many mathematicians) would say that it really isn’t necessary to switch. And yet, your likelihood of winning most definitely does improve if you switch. Math and statistics can be very interesting when it comes to these sorts of things.

NOTES:

         I do NOT want you to simply paraphrase. I want you to think about the problem and show that you understand the reasoning behind why the user should switch. Then simply write it out in your own words.

         **Your response does not have to be long**! A single paragraph is just fine.