HW 2 Model Thinking MA 2040/CS 2040 Spring 2017

Homework 2: Modules 3 and 4

Your answers should include explanations and your supporting work.

1. In this experiment we flip a fair coin 5 times and count of the number of heads.
    a. Compute the probabilities that we get 0 heads, 1 head, 2 heads, 3 heads, 4 heads and 5 heads.
    b. Find the mean and the standard deviation of the count of the number of heads.
2. In this experiment we flip a fair coin 100 times and count of the number of heads.
    a. Find the mean and the standard deviation of the count of the number of heads.
    b. Find the 68% interval, the 95% interval, and the 99.75% interval.
3. We have an airplane with 120 seats. We know that people who buy a ticket show up 90% of the time. What is the most seats should we sell if we want to be 97.5% certain that the plane is not overbooked?
4. State the Central Limit Theorem.
5. Name something that is not a normal distribution. Why is not normal?
6. Assume we have the following list of preferences. What is the winner?
   A>B>C
   B>C>A
   B>A>C
1. Assume we have the following list of preferences. What is the winner?
   A>B>C
   A>C>B
   C>A>B
1. State Condorcet's Paradox and make your own example.
2. The following is the statistics for two local taco meals and my preferences for the best taco meal. Using two decision models, a quantitative and a qualitative, find the best taco meal for me (note your two models may not agree).

	Meal 1	Meal 2	My Preference
Crunchy	yes	no	yes
Amount of meat	4 ounces	1 ounces	2 ounces
Amount of tomatoes	3 scoops	3 scoops	3 scoops

Amount of cheese	3 scoops	1 scoop	2 scoops
Number of peppers	4 peppes	1 peppers	2 peppers
Number of tacos	4	5	3

1. Assume we have the following taco meal options and our good friend Sara picks meal 3. We want to know her ideal taco meal (using the quantitative model). Which of the following possibilities could be Sara's ideal meal (you may pick more than one)?

	Meal 1	Meal 2	Meal 3
Amount of meat	2 ounces	4 ounces	3 ounces
Number of tacos	7	2	4

	Ideal 1	Ideal 2	Ideal 3	Ideal 4
Amount of meat	3 ounces	1 ounce	2 ounces	11 ounces
Number of tacos	5	8	4	3

1. The following was given as a probability distribution for a weight 6 sided die. Is it possible? Which Axiom failed?

Number on die face	1	2	3	4	5	6
Probability	1/2	1/4	1/8	1/16	1/32	1/64

1. For a fair 6 sided die, roll the die twice and add the numbers.
    a. The probability that the sum of the faces is 4.
    b. The probability that the sum of the faces is even.
    c. The probability that the sum of the faces is 4 given that the sum is even.
2. What is the difference between Classical Probability and Frequency Probability?

3. I am deciding to take a traqin or a plane to Niagara Falls this Spring. A train costs $150 and a plane costs $300. I hate being late and let's I view being late as costing me $75. If the plane is late %50 (an on time %50 of the time) and the train is late only %10 of the time, which mode of transportation should I choose.
4. Value of information. Assume I know the train will be late, what is the value of that information? Assume I know the plane will be late, what is the value of that information?
5. An investment costs $2000 and will with some unknown probability, p, be worth $10000 and will with some probability 1-p be worth zero dollars. Make a decision tree for this investment. If I invest in it than what do you infer about what I believe p to be?