Dorm Food.

At a particular university, the dorms’ dinner menus are entirely by the whims of the chef, who chooses an appetizer, an entree, and a dessert for each evening’s meal. A student at this university has been eating there for roughly 6 months (120 dinners).

1.1. The student notices that he’s had steak as entree 24 times and ice cream as dessert 48 times. He has had steak with ice cream in the same evening 4 times. Do the probabilities of steak being served and ice cream being served appear independent?

1.2. The chef, in a chat with the student, mentions that he thinks salads as appetizer goes well with pork chop as entree, so whenever he serves pork chop, he will serve salad with 50% chance. If pork chop is not being served, he only serves salad 10% of the time. Based on his observations, the student believes salad is served with a total frequency of 20%. What does this imply about the probability in which pork chop is being served?

Obesity.

This set of problems refer to the “Obesity.txt” data set, which can be downloaded from the course website (nablab.rice.edu/bioe439/) under Lecture Notes 2. The three data columns refer to height (in inches), weight (in pounds), and obesity status (1 = true).

2.1. Write and run a Matlab script for finding the number of people with body height between 65 and 72 inches (inclusive of 65 and 72).

2.2. Write a Matlab function “FindLightest(MinHeight)” which returns the height of the lightest person who is at least as tall as the specified height. What is the weight of the lightest person at least 70 inches tall?

2.3. The Body Mass Index is calculated as $\text{BMI} = \frac{\text{Weight}/2.2}{(\text{Height}+0.0254)^2}$. Write and run a Matlab script for finding mean BMI of the entire population.

2.4. Write and run a Matlab script for finding the 70th percentile BMIs of (a) non-obese people and (b) obese people.

2.5. Draw a random sample (without replacement) of 10 people with BMI between 20 and 22, and display their heights and weights. Seed your random number generator with ‘rng(914)’.

Additional Problems for BioE 539 Students.

3.1. A particular pain-relieving drug causes nausea in 5% of all patients. A particular scientist studies the patients, and concludes that among the 30% of the population that carries gene X, the probability of nausea side reaction increases to 15%. What is the probability, given that a patient does not carry gene X, of the patient getting nausea from the drug?

3.2. Refering to the “Obesity.txt” data set, write a Matlab script to simulate 1000 different samplings of non-obese people (column 3 is set to 0), with each sample being 10 people. Plot a histogram of the median weight observed through the course of these 1000 samplings. Use a different RNG seed x, where x ranges between 1001 and 2000, for each sampling.