

Book Homework

These prompts correspond to “Book Homework” portion of the homework on Canvas. You turn in the answers to these questions online.

- Consider the following contingency (frequency) table, in which two species of mice were tested for a specific parasite:

| | Infected | Not Infected |
|-----------|----------|--------------|
| Species 1 | 38 | 16 |
| Species 2 | 20 | 35 |

- Estimate the probability that a randomly selected mouse was species 1.
 - Estimate the probability that a randomly selected mouse was infected.
 - Estimate the probability that a randomly selected mouse was both infected and species 1.
 - Estimate the probability that a randomly selected mouse was not infected and species 2.
- Continue with the data from Problem 1.
 - If a mouse was species 1, what is the estimated probability they were infected?
 - If a mouse was species 2, what is the estimated probability they were infected?
 - What is the estimated probability that an infected mouse was species 1?
 - What is the estimated probability that an infected mouse was species 2?
 - Are the events that a mouse is species 1 and a mouse was infected independent?
 - For a particular disease, the probability of the disease is 0.04. If someone has the disease, the probability they test positive is 0.95. If they do not have the disease, the probability they test negative is 0.99.
 - Estimate the probability someone both tests positive and has the disease.
 - Estimate the probability that someone tests positive.
 - Estimate the probability that if someone tested positive, they have the disease.
 - Estimate the probability that if someone tests negative, they do not have the disease.
 - Consider the following contingency (frequency) table, in which a drug was being tested for allergy symptom relief:

| | Drug Group | Placebo Group |
|----------------|------------|---------------|
| Symptom Relief | 45 | 32 |
| No Relief | 12 | 25 |

- Estimate the probability that a subject was in the drug group, or had symptom relief, or both (the union).
 - Estimate the probability that a subject who was in the drug group had symptom relief.
 - Estimate the probability that a subject who was in the placebo group had symptom relief.
 - Estimate the probability that a subject had symptom relief overall, regardless of group.
 - How much higher was the estimated probability of symptom relief in the drug group vs. the placebo group (take the difference of the two)?
- The probability that a subject has a certain stomach bacteria is 0.85, the probability that a subject is showing signs of gastritis is 0.10, and the probability that a subject both has the bacteria and shows signs of gastritis is 0.08.
 - Find the probability that a subject either shows signs of gastritis, or has the stomach bacteria, or both (the union).
 - If a subject has the stomach bacteria, what is the probability that they show signs of gastritis?
 - If a subject does not have the stomach bacteria, what is the probability that they show signs of gastritis?
 - If a subject shows signs of gastritis, what is the probability they have the stomach bacteria?
 - Are the events of having the stomach bacteria and showing signs of gastritis independent?
 - Answer the following questions with TRUE or FALSE. It is good practice to explain your answers.
 - The intersection of two events A and B can be larger than the union of the same two events A and B .
 - The probability of a single event A must be smaller than or equal to the union of two events A and B .
 - The condition probability of A given B must be smaller than the intersection of the same two events A and B .
 - If two events are independent, that means $Pr\{A \text{ or } B\} = Pr\{A \text{ and } B\}$

R Homework

These prompts correspond to “R Portion” of the homeworks on Canvas. You use R to find the answers to the following questions, and submit your answers online.

- I. You will be working with the dataset `colors.csv`, which has the following columns:

Column 1: **Eye**: The eye color of the subject

Column 2: **Sex**: The hair color of the subject

Column 3: **GPA**: The college GPA of the subject

- (a) Plot a barplot of the eye color of the subjects. What color is the least common?
- (b) Plot a two category barplot of the subjects, using sex and eye color. Comparing men and women, who has a higher probability of brown eyes?
- (c) Plot a mosaic plot of sex and eye color. Are there more males or females in the study?
- (d) Plot a mosaic plot of sex and eye color. Do males or females tend to have a higher probability of blue eyes?
- (e) Plot a mosaic plot of sex and eye color. What eye color is least common for males?
- (f) Plot a histogram of GPA. What is the most common interval of GPA?
- (g) Plot a grouped boxplot of GPA by gender. Do males or females have a lower median GPA?
- (h) Plot a grouped boxplot of GPA by gender. Do males or females have more outliers?
- (i) Plot a grouped boxplot of GPA by eye color. Which eye color has the highest minimum?
- (j) Plot a grouped boxplot of GPA by eye color. Which eye color has the highest maximum?