

Homework 4: Conditional Probability, Bayes' Theorem

1. §2.1, #13, §2.3, #5, 7
2. A desk has three drawers. The first contains two gold coins, the second contains two silver coins, and the third contains one gold and one silver coin. A coin is drawn from a drawer selected at random. Suppose the selected coin is silver. What is the probability that the other coin in the drawer is gold?
3. English and American spellings are *rigour* and *rigor*, respectively. A man staying at a Parisian hotel writes this word, and a letter taken at random from his spelling is found to be a vowel. If 40% of the English-speaking men at the hotel are English and 60% are American, what is the probability that the writer is an Englishman?
4. A multiple choice exam has 5 choices per question. On 75% of the questions, you think you know the answer; on the other 25% of the questions, you just guess at random. Unfortunately, when you think you know the answer, you are right only 80% of the time. (a) Find the probability of getting an arbitrary question right. (b) If you do get a question right, what is the probability that it was a lucky guess (i.e., that it was one of the questions whose answers you just guessed at random)?
5. A deck is missing one card. You draw two cards, and both are diamonds. What is the probability that the missing card is diamonds?
6. Scotty has n keys of which one will open the door to the engine room.
 - (a) If he tries the keys at random, discarding those that do not work, what is the probability that he will open the door on the k th try?
 - (b) What if he does not discard the previously tried keys?
7. Draw a card. If it's diamonds, place it back in the deck and draw another card. If the first card is not diamonds, then draw a second card without replacing the first card.
 - (a) Find the probability that the second card is the queen or king of diamonds.
 - (b) If the second card is the two of clubs, find the probability that the first card was diamonds.
8. Professors X, Y, and Z are teaching sections of a probability course at Wisconsin Tech next semester. James estimates that his probability of passing the course is 80% with Professor X, 60% with Professor Y, and 40% with Professor Z. He will determine which Professor to take by rolling a 6-sided die. If he rolls a 1, he will take the section with Professor X; if he rolls a 2 or 3, then he takes Professor Y; and if he rolls a 4, 5, or 6, then he takes Professor Z. After the semester ends, we learn that James did, indeed, pass the course. What is the probability that he was enrolled in Professor X's section.