

## Lecture 5 – Agenda & Examples

### Agenda

1. Review Questions
2. Probability Tree
3. Multiplication Principle (2 or 3 events)
4. Law of Total Probability (2 or 3 events)
5. Bayes Rule (intersection form)
6. Examples

### Review

1. A friend of mine is giving a dinner party. His current wine supply includes 8 bottles of zinfandel, 10 of merlot, and 12 of cabernet, all from different wineries.
  - a. If he wants to serve 3 bottles of zinfandel and serving order is important, how many ways are there to do this?
  - b. If 6 bottles of wine are to be randomly selected from the 30 for serving, how many ways are there to do this?
  - c. If 6 bottles are randomly selected, how many ways are there to obtain 2 bottles of each variety?
  - d. If 6 bottles are randomly selected, what is the probability that this results in 2 bottles of each variety being chosen?
  - e. If 6 bottles are randomly selected, what is the probability that all of them are the same variety?
2. In five-card poker, a straight consists of 5 cards with adjacent dominations. Assume here that aces can be high or low.
  - a. If you are dealt a 5-card hand, what is the probability that it will be a straight with high card 10?
  - b. What is the probability that it will be a straight of any high card?
  - c. What is the probability that it will be a straight flush (all cards in the same suit)?
3. Show that  $\binom{n}{k} = \binom{n}{n-k}$ .

### Lecture

1. Coffee - CNBC just posted an article last night about how Dunkin is “crushing” Starbucks this year in the stock market. The probability of Dunkin Donuts stock price increasing is 50%. The probability of Starbucks stock price increasing knowing that Dunkin Donuts’ did is 40%. The probability of Starbucks stock price increasing knowing that Dunkin Donuts’ did not is 1%.
  - a. Write down the 3 pieces of given information in terms of the probability of events A (Starbucks stock price increasing) and B (Dunkin Donuts stock price increasing).
  - b. Draw a probability tree for this problem.

- c. What is the probability that Starbucks' stock price increases?
  - d. Given that Starbucks' stock price increased, what is the probability that Dunkin Donuts' stock price increased?
- 2. Wine Pairing - In pairing which wine to drink with which meal, the general rule of thumb is to pair the color of the wine to the color of the main course. So, knowing that the person ordered fish the probability of the person pairing their meal with a white wine (properly) is 78%. Given that the person did not order fish, the probability of the person pairing their meal with a white wine is .34. The probability of the person ordering fish is .27.
  - a. Write down the 3 pieces of given information in terms of the probability of events F (the person ordered fish) and W (the person paired their meal with white wine).
  - b. Create a probability tree for this problem.
  - c. Find the probability that the person paired their meal with white wine.
  - d. Find the probability that given they ordered white wine, they properly paired their meal.
- 3. The Reviews editor for a certain scientific journal decides whether the review for any particular book should be short (1-2 pages), medium (3-4 pages), or long (5-6 pages). Data on recent reviews indicate that 60% of them are short and 30% are medium. Reviews are submitted in either Word or LaTeX. For short reviews, 80% are in Word, whereas 50% of medium reviews are in Word and 30% of long reviews are in Word. Suppose a recent review is randomly selected.
  - a. What is the probability that the selected review was submitted in Word format?
  - b. If the selected review was submitted in Word format, what are the probabilities of it being short, medium, or long?