Bookmarks

- Introduction
- 1. Probability and Inference

Introduction to Probability (Week 1)
Exercises due Sep 21, 2016 at 21:00 UTC

Probability Spaces and Events (Week 1)
Exercises due Sep 21, 2016 at 21:00 UTC

Random Variables (Week 1)
Exercises due Sep 21, 2016 at 21:00 UTC

Jointly Distributed Random Variables (Week 2)
Exercises due Sep 28, 2016 at 21:00 UTC

Conditioning on Events (Week 2)
Exercises due Sep 28, 2016 at 21:00 UTC

Homework 1 (Week 2)
Homework due Sep 28, 2016 at 21:00 UTC

Inference with Bayes' Theorem for Random Variables (Week 3)
Exercises due Oct 05, 2016 at 21:00 UTC

Independence Structure (Week 3)
Exercises due Oct 05, 2016 at 21:00 UTC

Homework 2 (Week 3)

Exercise: The Soda Machine

(3/3 points)

A soda machine advertises 7 different flavors of soda. However, there is only one button for buying soda, which dispenses a flavor of the machine's choosing. Adam buys 14 sodas today, and notices that they are all either grape or root beer flavored.

- **(a)** Assuming that the soda machine actually dispenses each of its 7 flavors randomly, with equal probability, and independently each time, what is the probability that all 14 of Adam's sodas are either grape or root beer flavored? (Please be precise with at least **10 decimal places**, unless of course the answer doesn't need that many decimal places. You could also put a fraction.)

  0.0000000241572436207 ✔ **Answer:** (2/7)^14

- **(b)** How would your answer to the (a) change if the machine were out of diet cola, ginger ale, so it randomly chooses one of only 5 flavors? (Please be precise with at least **10 decimal places**, unless of course the answer doesn't need that many decimal places. You could also put a fraction.)

  0.0000026843545600000 ✔ **Answer:** (2/5)^14

- **(c)** What if the machine only had 3 flavors: grape, root beer, and cherry? (Please be precise with at least **10 decimal places**, unless of course the answer doesn't need that many decimal places. You could also put a fraction.)

  0.0034254873907817481 ✔ **Answer:** (2/3)^14

Solution:

- **(a)** Assuming that the soda machine actually dispenses each of its 7 flavors randomly, with equal probability, and independently each time, what is the probability that all 14 of Adam's sodas are either grape or root beer flavored?

Homework due Oct 05, 2016 at 21:00 UTC

Notation Summary (Up Through Week 3)

Mini-project 1: Movie Recommendations (Week 3)
Mini-projects due Oct 12, 2016 at 21:00 UTC

Solution: Let's first consider a single soda, which could be one of 7 flavors, 2 of which are desired. Thus the probability of the soda being either grape or root beer is $\frac{2}{7}$. Since each soda is dispensed independently, the probability of all 14 sodas being grape or root beer is $(\frac{2}{7})^{14} \approx 2.416 \times 10^{-8}$.

- **(b)** How would your answer to the (a) change if the machine were out of diet cola, ginger ale, so it randomly chooses one of only 5 flavors?

  Solution: If there are only 5 flavors of soda available, the probability of getting either grape or root beer is $\frac{2}{5}$. Thus, once again assuming each soda is chosen independently, the probability that all 14 sodas are grape or root beer is $(\frac{2}{5})^{14} \approx 2.684 \times 10^{-6}$.

- **(c)** What if the machine only had 3 flavors: grape, root beer, and cherry?

  Solution: Similarly, with only 3 flavors to choose from, the probability becomes $(\frac{2}{3})^{14} \approx 0.003425$.

You have used 1 of 5 submissions