

CSE 312: Foundations of Computing II

**Instructor:** Alex Tsun

**Date:** 6/26/30

**Lecture Topics:** 2.1 Discrete Probability, 2.2 Conditional Probability

[Tags: PSet1 Q8a, Equally Likely Outcomes]

1. Suppose you went trick-or-treating (as an adult) and were able to nab  $N$  total candies,  $K$  of which are kit-kats. Your responsible parent says you can only eat  $n$  of them tonight. You reach in and randomly grab  $n$  of them. Let  $X$  be the number of kit-kats you grabbed. What is  $P(X = k)$  for valid values of  $k$ ? (**Hint:** This is very similar to the fish question on the CC!)

[Tags: Bayes Theorem, Law of Total Probability]

2. Sometimes, doctors run tests to see if we have a disease, but they might not be perfectly accurate. Suppose we are testing for the llama-flu, a highly contagious new disease. So far, only **0.1%** of the population has it. If you have llama-flu, the probability the test is negative is **2%**. If you don't have llama-flu, the probability the test is negative is **95%**. The most important question after all of this: if you test positive, what is the probability you have llama-flu?

[Tags: Equally Likely Outcomes, Bayes Theorem, Law of Total Probability]

3.

Suppose we have three urns with the following number of red, white, and blue balls in them:

Urn	Red	White	Blue
A	6	5	2
B	4	3	6
C	5	6	7

Suppose we choose an urn by the following rules, after flipping a fair coin three times independently:

- (a) If all flips are the same, pick from Urn A
- (b) If there is exactly one head, pick from Urn B
- (c) Else, pick from Urn C

After choosing an urn, we draw 5 balls without replacement, and let  $R$  be the event that exactly three of them are red. Let  $A, B, C$  be the events we chose urn A, B, C respectively. What is the probability we chose urn C, given that we drew exactly three of the five balls being red? We'll solve this in three steps.

- (a) First, find  $\Pr(A)$ ,  $\Pr(B)$ ,  $\Pr(C)$ .
- (b) Now find  $\Pr(R)$ , and do not simplify.
- (c) Finally, compute  $\Pr(C | R)$ , and do not simplify.

For more examples and solutions (S01 and S02), see

<https://courses.cs.washington.edu/courses/cse312/18sp/>.