Stat 134: Section 9

Adam Lucas

February 25th, 2019

Conceptual Review

a. What does a Geometric (p) random variable on $\{1, 2, 3, \ldots\}$ represent? What if it is instead distributed on $\{0, 1, 2, \ldots\}$?

b. How do we calculate the expected value of a Geometric (p) random variable?

Problem 1

Suppose that in a particular application requiring a single battery, the mean lifetime of a battery is 4 weeks, with an SD of 1 week. The battery is replaced with a new one when it dies, and so on. Assume battery lifetimes are independent. Approximate the chance that more than 26 replacements will have to be made in a two year period, starting with a fresh battery and not counting that one as a replacement. *Ex 3.3.23 in Pitman's Probability*

Should we use the continuity correction here? Why/why not?

Problem 2

Recall the chopsticks example from Section 8: Suppose we have n unique pairs of chopsticks in a drawer (so $2n$ sticks in total). We grab k pairs of these at random from the drawer and try to make matching pairs from this pile of $2k$ chopsticks. Let X represent the number of matching pairs.

Last time, we calculated

$$\mathbb{E}(X) = n\left(\frac{\binom{2}{2}\binom{2n-2}{2k-2}}{\binom{2n}{2k}}\right).$$

Now, find $Var(X)$.