9-9 NB0203

Monday, September 9, 2019 12:45 PM

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9-9: Wrangling Notebook
CSCI 3022 Fall 19

Opening **Example**: Suppose we flip a coin with a 1% chance per flip of landing on heads. Define $X =$ the number of tails flips before we see a heads. What is $P(X = 0)$? $P(X = 1)$? $P(X = i)$? Verify that $P(X) = 1$ over all of Ω.

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Common problem:
1) How many years until we see 18in rain?
2) How long until Lions win Super Bowl?

Opening Example Sol'n

Suppose we flip a coin with a 1% chance per flip of landing on heads. Define $X =$ the number of tails flips before we see a heads. What is $P(X = 0)$? $P(X = 1)$? $P(X = i)$? Verify that $P(X) = 1$ over all of Ω.

1) $P(X=0) = P(\{H\}) = .01$

2) $P(X=1) = P(\{T \text{ then } H\}) = P(\{T\}) \cdot P(\{H\}) = .99 \cdot .01$

3) $P(X=2) = P(\{TTH\}) = .99^2 \cdot .01$

i) $P(X=i) = .99^i \cdot .01$

Recall: $\sum_{n=0}^{\infty} ar^n = \frac{a}{1-r}$

$P(\Omega) = P(X \in \{0, 1, 2, \cdots \infty\})$

$$\sum_{i=0}^{\infty} P(X=i) = \sum_{i=0}^{\infty} .99^i \cdot .01 = \frac{.01}{1-(.99)} = \frac{.01}{.01} = 1.$$

Opening Example Sol'n

Suppose we flip a coin with a 1% chance per flip of landing on heads. Define $X =$ the number of tails flips before we see a heads. What is $P(X = 0)$? $P(X = 1)$? $P(X = i)$? Verify that $P(X) = 1$ over all of Ω.

1. $P(X = 0) = P(\{H\}) = .01.$
2. $P(X = 1) = P(\{TH\}) = P(\{T\})P(\{H\}) = .99 \cdot .01.$
3. $P(X = 2) = P(\{TTH\}) = P(\{T\})^2 P(\{H\}) = .99^2 \cdot .01.$
4. $P(X = i) = P(\{T \ldots TH\}) = P(\{T\})^i P(\{H\}) = .99^i \cdot .01.$
5. $\sum_{i=0}^{\infty} P(X = i) = \sum_{i=0}^{\infty} .99^i \cdot .01 = \frac{.01}{1-.99} = 1.$ Sanity check passed!

Announcements and Reminders

- Homework due Friday the 13th.
- More probability (conditional! total!) in lecture Wednesday.
- Last time: sets! events! probabilities!

NB01

It's our second **notebook day**! Let's get rowdy in here.

- nb02, 03 and the data sets are on the course page.
- Check out the various cheat sheets on the course Modules/Resources page.
- Talk to and work with your neighbor(s). Seriously. You have all of your spare time to solve problems on your own, there's cognitive processes that have to be built and maintained by collaborating! Plus it's more fun (I hope).