Discussion Week 2

Spring 2021 (Yu)

Exercise 1

Suppose that Lauren attends Ordinary HS. Let k denote the number of times Lauren gets detention in her senior year, so k can be any non-negative integer $k = 0, 1, 2, 3, \ldots$ The probability of Lauren having k detention sessions is given by:

$$P(k) = \alpha \cdot \frac{6^k}{k!}$$

   a. Find the probability that Lauren has detention 0 times.

   b. Find the probability that Lauren has detention at least once.

   c. What's the expected number of detention sessions Lauren has? Determine the answer in two distinct ways.

Exercise 2

Now, altering the setup above, suppose that Lauren can attend Ordinary High school for an eternity, that is, for $1, 2, 3, 4 \ldots$ days. Each day, her probability of getting detention is p, with $0 < p < 1$. If she gets detention, she is expelled from school (to her relief?)

   a. Find the the probability that Lauren is expelled from school on the jth day of school.

   b. The school year starts on September 1st. Let E_1 denote the event that Lauren is expelled after Halloween. Let E_2 denote the event that Lauren is expelled after Thanksgiving. Which event is more likely, or are they equal in probability?

Exercise 3

You decide to draw play a game of chance that involves selecting marbles from a box (riveting and interactive game play). The box contains 2 green marbles and 3 red marbles. The rules of the game require you to draw marbles without replacement and the game stops when you draw a red marble. If the marble is green then you repeat draws until you select a red marble. Let the random variable X represent the number of green marbles drawn.

   a. Find the probability distribution of X

b. Suppose that it costs 5 dollars to play and you win 10 dollars for every green marble that you pull. We would like to determine if the game is fair, meaning that the expected payout is the same as the cost to play. In other words, do we break even on average when playing.

c. Suppose that the person running the game suggests that the rules change to be 8 dollars for the first green marble and 18 dollars for the second. In an effort to not get scammed determine if this new rule is fair. Is one game better than the other?