Assignment 2 Question 11

Tuesday, September 29, 2020 11:33 PM

a) $X \rightarrow$ Random Variable when 2 baloons of same color are hit

$$P(X) = 1 \cdot \frac{{}^{n}P_{x-1}}{n^{x-1}} \cdot (x-1)$$

- 1: first baloon is hit
- $\frac{{}^{n}P_{x-1}}{n^{x-1}}$: ways to not repeat colors for $x-1$ moves
- $(x-1)$: hitting any of the $x-1$ hit colors

$$f_x(X) = \begin{cases} \frac{{}^{n}P_{x-1}}{n^{x-1}} (x-1) & \text{if } 0 < X \leq n \\ 0 & \text{otherwise} \end{cases}$$

b) If i balloons have been hit

$Y \rightarrow$ Random Variable of number of balloons hit before shooting a new color.

$$P(Y) = \left(\frac{i}{n}\right)^{y-1} \frac{n-i}{n}$$

- $\left(\frac{i}{n}\right)^{y-1}$: Shoot in i/n balloons for $y-1$ moves
- $\frac{n-i}{n}$: shoot a new color (from $n-i$ balloons)

$$f(Y) = \begin{cases} \left(\frac{i}{n}\right)^{y-1} \frac{n-i}{n} & \text{if } 0 < y \\ 0 & \text{otherwise.} \end{cases}$$