CS 70 Discrete Mathematics and Probability Theory
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DIS 5B

1 Such High Expectations

Note 19

Suppose X and Y are independently drawn from a Geometric distribution with parameter p.

(a) Compute $\mathbb{E}[\max(X,Y)]$.

(b) Compute $\mathbb{E}[\min(X,Y)]$.

2 Number Game

Note 20

Sinho and Vrettos are playing a game where they each choose an integer uniformly at random from $[0,100]$, then whoever has the larger number wins (in the event of a tie, they replay). However, Vrettos doesn't like losing, so he's rigged his random number generator such that it instead picks randomly from the integers between Sinho's number and 100. Let S be Sinho's number and V be Vrettos' number.

(a) What is $\mathbb{E}[S]$?

(b) What is $\mathbb{E}[V \mid S = s]$, where s is any constant such that $0 \leq s \leq 100$?

(c) What is $\mathbb{E}[V]$?

3 Number of Ones

Note 20

In this problem, we will revisit dice-rolling, except with conditional expectation. (*Hint*: for both of these subparts, the law of total expectation may be helpful.)

(a) If we roll a die until we see a 6, how many ones should we expect to see?

(b) If we roll a die until we see a number greater than 3, how many ones should we expect to see?