MAT-CSC A67: Discrete Mathematics — Summer 2024

Quiz 13

Due Date: Friday, August 9, 11:59 PM, on Crowdmark

Q1. During his turn in a game, Erfan must roll a fair nine-sided die. Erfan's score is computed as $|X - 5|$, where X is the result of the roll. Find the expected value of Erfan's score.

Q2. Scientists are considering whether a wildfire will happen within the next year in three different national parks, namely Jasper, Banff, and Kootenay National Park. Let E_1, E_2, and E_3 be the events that there is no wildfire within the next year in each of three national parks.

2.a. Let E be the event that none of the parks have a wildfire within the next year. If it is possible, determine whether $\mathbb{P}(N) < \mathbb{P}(E_1)$, $\mathbb{P}(N) = \mathbb{P}(E_1)$, or $\mathbb{P}(N) > \mathbb{P}(E_1)$. If it is not possible, explain why.

2.b. The Scientists have determined that $\mathbb{P}(E_1) = 0.93$, $\mathbb{P}(E_2) = 0.95$, and $\mathbb{P}(E_3) = 0.99$. If it is possible, find the chance that at least one of the three parks doesn't have a wildfire within the next year. Otherwise, provide the best possible bounds.

2.c. If it is possible, find the chance that none of the three parks have a wildfire within the next year. Otherwise, provide the best possible bounds.

2.d. Suppose that the scientists have determined that the chance of a wildfire in the first park has dependency on the chance of a wildfire in the second park. In particular, they have found that $\mathbb{P}(E_2 \mid E_1) = 0.99$. If it is possible, find the chance that there is a wildfire in the first park within the next year, but not in the second park. Otherwise, provide the best possible bounds.