Math 5411 – Mathematical Statistics I– Fall 2024
w/Nezamoddini-Kachouie

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Homework #1 – August 23, 2024

#1 Write the sample space of rolling two dice.

The sample space, Ω, of rolling two dice is

$$\begin{aligned}\Omega = \{\, &(1,1),(1,2),(1,3),(1,4),(1,5),(1,6),\\ &(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),\\ &(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),\\ &(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),\\ &(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),\\ &(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)\,\}\\ |\,\Omega\,| &= 36\end{aligned}$$

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#2 There are three traffic lights, each with two possible outcomes, stop (s) or continue (c). Find the probability of each possible outcome when a car passes through all three traffic lights. For example a possible outcome is (s, c, c). List all possible outcomes and find the probability of each outcome assuming stop and continue are equally likely (0.5, 0.5) at each traffic light.

$$\begin{aligned}\Omega &= \{ccc, ccs, csc, css, scc, scs, scc\}\\ |\,\Omega\,| &= 6\end{aligned}$$

Since the likelihood of each outcome is the same, let a_i be a simple event where $i = [1 \dots 6]$, then $p(\Omega) = 1 = \sum_{i=1}^{|\Omega|} p(a_i) = |\,\Omega\,|\, a_i$ for any $i = 1, \dots, 6$, thus each $a_i = 1/|\,\Omega\,| = \frac{1}{6}$