Practice Problems.

1. You roll four distinct 6-sided dice with sides numbered from 1-6 and sum the numbers obtained. What is the (classical) probability that the sum is 12?

2. You roll five dice that are shaped like the Platonic solids (Tetrahedron = 4-sided; Cube = 6-sided; Octahedron = 8-sided; Dodecahedron = 12-sided; Icosahedron = 20-sided). What is the probability that the sum is 15?

3. Rock-Paper-Scissors is a game played by two people. The players simultaneously form hand gestures in one of the three shapes: Rock (closed fist), Paper (flat hand), and Scissors (index and middle finger extended). If the two players make different gestures, then Rock beats Scissors, Scissors beats Paper, and Paper beats Rock. Otherwise, the game is a draw.

(a) What is the probability of a draw?

Now consider an *n*-player version, $n \ge 2$. In a given round of play, all players make simultaneous gestures. If exactly two different kinds of gestures are made, then those with the losing gesture are eliminated and the remaining players move to the next round where play is repeated. If it is not the case that exactly two different kinds of gestures are made in some round, then the round is a draw and all players proceed to the next round.

(b) What is the probability of a draw in the first round of the *n*-player version?

4. A genii has the power to grant 100 wishes of identical magical content. The genii intends to distribute these wishes to 10 Discrete Mathematics students. What is the probability that each student will get at least 3 wishes if the genii is required to give away all of his wishes?

5. If $f : k \to k$ is a permutation, then *i* is called a **fixed point** of *f* if f(i) = i. What is the probability that a randomly chosen permutation $f : k \to k$ has no fixed points? What happens to your answer as $k \to \infty$?