1. Let $X$ be the random variable whose value is the number of aces you get by drawing 18 cards at random without replacement from a standard deck of 52 cards. Compute $E(X)$.

2. Let $X$ be the random variable whose value is the number of cards you draw at random without replacement from a standard deck of 52 cards before you draw a spade. Compute $E(X)$. (Hint: The position of the 13 cards of interest divides the deck into 14 sections. By symmetry each of these sections has the same expected number of cards in each of these sections.)

3. Let $X$ denote the random variable whose value is the product of the numbers obtained by rolling 2 dice, each having 12 sides, fairly and independently. Compute $E(X)$ and $\text{Var}(X)$. (You may use that if two random variables are independent, so are their squares.)

4. Let $X$ be a random variable that takes on any of -2, -1, 0, 1, 2 with equal probability (and has zero probability of having any other value), and let $Y = X^2$. Compute $\text{Cov}(X, Y)$ directly from the definition. Also, determine whether $X$ and $Y$ are independent.

5. (SOLO PROBLEM) Suppose that you roll a 8-sided die fairly and independently 250 times. Let $X_i$ be the random variable whose value is the number that results from the $i$-th roll, and let

$$X = \sum_{i=1}^{250} X_i.$$ 

Use Chebyshev’s inequality to find a lower bound on the probability that $1025 < X < 1225$. 