1. Let $X$ be the random variable whose value is the number of queens you get by drawing 15 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 queen. Compute $E(X)$. (Hint: The position of the 4 cards of interest divides the deck into 5 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 8 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 -3, -2, -1, 0, 1, 2, 3 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 6-sided die fairly and independently 300 times. Let $X_i$ be the random variable whose value is the number that results from the $i$-th roll, and let

$$X = \sum_{i=1}^{300} X_i.$$ 

Use Chebyshev’s inequality to find a lower bound on the probability that $1010 < X < 1090$. 