1. Let $G$ be a random graph with $n$ vertices and $m$ edges generated using the first random graph algorithm from lecture 9. How large should $m$ be to have high probability (say 0.99) that the graph has $\sqrt{n}$ or fewer connected pieces?

2. Suppose a fair 6-sided die is tossed once. Let $X$ be a random variable which is 1 if the number on the die is even, 0 otherwise. Let $Y$ be a variable which is 1 if the number on the die is 4 or greater. Compute:

   (a) The Covariance $\text{Cov}(X, Y)$ of $X$ and $Y$.
   
   (b) Compute the Variance $\text{Var}(X + Y)$ of the sum of $X$ and $Y$ using (a).

3. Let $G$ be a random graph generated using the second algorithm from lecture 9. What is the threshold probability for a 5-clique in the graph?

4. Give Markov, Chebyshev and Chernoff bounds for the following problem: A fair die is tossed 1000 times. The expected value of the sum of the numbers is 3500. What is the probability that the sum is greater than 5000?