1. Suppose $X_1, X_2$ represent 2 independent rolls of a 6-sided die.
   
   (a) What is the joint probability mass function of $X_1, X_2$?
   
   (b) Calculate the joint probability mass function of $Y, X_1$ where $Y = \max\{X_1, X_2\}$. Are they independent?
   
   (c) Find an event which can be described in terms of $Y$ and give all the outcomes in that event.
   
   (d) Find an event which can be described in terms of $X_1, X_2$ but not in terms of $Y$ and give all the outcomes in that event.

2. An urn consists of 5 white and 8 red balls. Two balls are randomly picked from this urn. Let $X_1$ and $X_2$ be the colors of the two balls. Find the joint probability mass function of $X_1$ and $X_2$ when
   
   (a) The balls are picked with replacement
   
   (b) The balls are picked without replacement

   Are $X_1$ and $X_2$ independent in parts a and/or b?

3. Each of the members of a 7-judge panel independently makes a correct decision with probability 0.7. If the panel's decision is made by the majority rule, what is the probability that the panel makes the correct decision? Given that at most 4 judges agreed, what is the probability that the panel made the correct decision?

4. Find the coefficient of the term $x_2^3x_3^2x_4^5$ in the expansion of $(x_1 + 2x_2 + 3x_3 + 4x_4)^{10}$. 