Homework 1

1. (a) Two cards are selected in sequence from a standard deck. Find the probability that the second card is a queen, given that the first card is a king. (Assume that the king is not replaced.)
   (b) Two cards are selected, with replacement, from a standard deck. Find the probability of selecting a king and then selecting a queen.
   (c) What is the probability that a poker hand is a full house? A poker hand consists of five random selected cards from an ordinary deck of 52 cards. It is a full house if three cards are of the one denomination and two cards are of another denomination: for example, three queens and two 4's.

2. An experiment consists of tossing a pair of 6-sided dice.
   (a) list the elements of the sample space S;
   (b) list the elements corresponding to the event A that the sum is greater than 9;
   (c) list the elements corresponding to the event B that a 5 occurs on either dice;
   (d) list the elements corresponding to the event A';
   (e) list the elements corresponding to the event $A' \cap B$;
   (f) list the elements corresponding to the event $A \cup B$;

3. Suppose that we have two urns, cleverly named Urn I and Urn II. Suppose that Urn I has 2 red marbles and 2 blue marbles, and Urn II has 1 red and 3 blue marbles. We flip a fair coin to select an urn. If head occurs, Urn I is selected, otherwise, Urn II. Having selected an urn we select a marble without looking in the urn. It so happens that the marble we chose is red. Our question is: what is the probability that we chose Urn I?

4. Suppose that we roll a pair of fair 6-sided dice, so each of the 36 possible outcomes is equally likely. Let A denote the event that the first dice lands on 4, let B be the event that the sum of the dice is 7.
   (a) Are A and B disjoint (mutually exclusive)?
   (b) Are A and B independent?
   (c) **True or False**. Determine whether the statement is true or false.
      i. If two events, say E_1 and E_2, are independent, then E_1 and E_2 are disjoint.
      ii. If two events, say E_1 and E_2, are disjoint, then E_1 and E_2 are independent.