Math 351, Probability
Problem Set 3
Due September 20, 2012 in class

1. If the letters of the word GOLDIN are arranged randomly in a row, what is the probability that none of the letters in the chosen word is in the same position in which it appears in GOLDIN?

   Hint. Consider the event E_1 that G is in the right place, the event E_2 that O is in the right place, etc. How do you calculate the probability of each E_i? Their union? What is the relationship between the probability you want to calculate and the probability that one of the E_i will happen?

2. Two cards are chosen at random from a deck of 52 cards. What is the probability that they

   (a) are from different suits?

   (b) are both 4s?

3. Find a formula for the number of functions from 1,2,...,k **onto** 1,2,...,n.

   Hint: For $i = 1, 2, ..., n$, let k_i be the number of functions that do not contain i in their ranges. Use inclusion-exclusion.

4. How many people need to be in a room in order that the probability that at least two of them have the same birthday is at least 0.8?

5. Compute the probability that a bridge hand (13 cards) has at least two cards from every suit.

6. A coin is flipped until heads has appeared four times. What is the probability that the fourth head appears on the tenth flip?

7. A blue die and a red die are rolled. What is the probability that

   (a) their sum is at least 6, given that the red die is even?

   (b) the red die is 3, given that their sum is at least 6?

8. Two cards are randomly chosen without replacement from an ordinary deck of 52 cards. Let B be the event that both cards are hearts. Let A be the event that the ace of hearts is chosen, and H the event that at least one heart is chosen.

(a) Find $P(B)$.

(b) Find $P(B|A)$.

(c) Find $P(B|H)$.