Practice Questions I

.

1.

There are 3 arrangements of the word DAD, namely DAD, ADD, and DDA. How many arrangements are there of the word PROBABILITY?

2.There are six men and seven women in a ballroom dancing class. If four men and four women are chosen and paired off, how many pairings are possible?

3.Let A and B be two events. Suppose the probability that neither A or B occurs is 2/3. What is the probability that one or both occur?

4.Let C and D be two events with $P(C) = 0.25$, $P(D) = 0.45$, and $P(C \cap D) = 0.1$. What is $P(C^c \cap D)$?

5.Suppose you are taking a multiple-choice test with c choices for each question. In answering a question on this test, the probability that you know the answer is p. If you don't know the answer, you choose one at random. What is the probability that you knew the answer to a question, given that you answered it correctly?

6.Two dice are rolled.

A = 'sum of two dice equals 3'

B = 'sum of two dice equals 7'

C = 'at least one of the dice shows a 1'

What is $P(A|C)$?

What is $P(B|C)$?

Are A and C independent? What about B and C?

7.A multiple choice exam has 4 choices for each question. A student has studied enough so that the probability they will know the answer to a question is 0.5, the probability that they will be able to eliminate one choice is 0.25, otherwise all 4 choices seem equally plausible. If they know the answer they will get the question right. If not they have to guess from the 3 or 4 choices.

As the teacher you want the test to measure what the student knows. If the student answers a question correctly what's the probability they knew the answer?

8.Suppose that $P(A) = 0.4$, $P(B) = 0.3$ and $P((A \cup B)^{\smile}) = 0.42$. Are A and B independent?

9.

Suppose that X takes values between 0 and 1 and has probability density function 2x. Compute Var(X) and Var(X^2).

10.

Compute the expectation and variance of a Bernoulli(p) random variable.

11.Suppose 100 people all toss a hat into a box and then proceed to randomly pick out a hat. What is the expected number of people to get their own hat back.

Hint: express the number of people who get their own hat as a sum of random variables whose expected value is easy to compute.

12.

Suppose that the occurrences of earthquakes and high winds are unrelated. Also suppose that, at a particular location, the probability of a "high"wind occurring in any single minute is 10and the probability of a "moderate"earthquake in any single minute is 10

Find the probability of joint occurrence of the two events during any minute.

Building codes do not require the engineer to design buildings for the combined effects of these loads. Is this reasonable?

Find the probability of the occurrence of one or the other or both during any minute.

For rare events, i.e. events with small probabilities of occurrence, the engineer frequently assumes:

$$P(A \cup B) \sim P(A) + P(B)$$

Is this reasonable?

If the events in consecutive minutes are mutually independent, what is the probability that there will be no moderate earthquake in a year at this location?

In 10 years?

Are X and Y independent?

(Central Limit Theorem) Let $X_1, X_2, \ldots, X_{81}$ be i.i.d., each with expected value $= E(X_i) = 5$, and variance $\sigma^2 = Var(X_i) = 4$. Approximate $P(X_1 + X_2 + \cdots X_{81} > 369)$, using the central limit theorem.

18.05 Introduction to Probability and Statistics
Spring 2014