Fall 2016 COT 3100 Section 1 Homework 6
Assigned: 11/7/2016
Due: 11/14/2016 (in lecture)

Note: Please *justify* your answers and why you use each formula.

1) In alpha testing a new software package, a software engineer finds that the number of defects per 100 lines of code is a random variable X with probability distribution:

x	1	2	3	4
Pr(X = x)	0.5	0.3	0.15	0.05

Find E(X) and Var(X).

2) A lottery allows a player to choose 6 values out of 60. The goal of the lottery is to break even exactly, making its cash prizes equal to the amount of money spent by the contestants. Each ticket costs $1 to buy and players receive winnings if they match 3, 4, 5 or all 6 numbers. If the payout for matching 3 numbers is $10, matching 4 numbers is $100, and matching 5 numbers is $10,000, what does the payout for matching all 6 numbers need to be?

3) The probability that it rains during a summer's day in a certain town is 0.3. In this town, the probability that the daily maximum temperature exceeds 25 degrees Celsius is 0.4 when it rains and 0.7 when it does not rain. Given that the maximum daily temperature exceeded 25 degrees Celsius on a particular summer's day, find the probability that it rained on that day.

4) Derek has a 32% chance of making exactly 1 free throw out of 2 free throws? What is his chance of making a single free throw? (Note: There are two possible answers.)

5) In Arup's Game of Dice 2, you roll a fair pair of six-sided dice and record the total. If this total is 2, 4 or 12, you win. If it's a 5 or 11, you lose. In all other cases, you roll the pair of dice again. If the sum of this second roll exceeds the sum of your first roll, you win! Otherwise you lose. (For example, if you roll a 5 followed by a 6, you win, but if you roll a 10 followed by another 10, you lose.) What is the probability of winning Arup's Game of Dice?

6) Kellogs makes 27 types of cereal. You are sent a random box out of these 27 six months in a row. What is the probability that you receive at least one repeated box?

7) Suppose that one person in 10,000 people has a rare genetic disease. There is an excellent test for the disease; 99.6% of the people with the disease test positive and only 0.09% of the people who don't have it test positive. What is the probability that someone who tests positive has the disease? What is the probability that someone who tests negative does not have the disease?

8) Suppose we flip a fair coin until we get the same result two times in a row. What is the total number of times we are expected to flip the coin?

9) Suppose E and F are events in a sample space and $p(E) = 2/3$, $p(F) = 3/4$, and $p(F \mid E) = 5/8$. Find $p(E \mid F)$.

10) What is the probability that each player has a hand containing an ace when each of four players receives 13 cards from the standard deck of 52? (Note: No two players will have the same card.)