03 September 2014 - Due Wednesday, 10 September at 5:00 PM in Dropbox

1. Read the book.

2. *Problem 1.5.* Out of the students in a class, 60% are geniuses, 70% love chocolate, and 40% fall into both categories. Determine the probability that a randomly selected student is neither a genius nor a chocolate lover.

3. *Problem 1.8.* You enter a special kind of chess tournament, in which you play one game with each of three opponents, but you get to choose the order in which you play your opponents, knowing the probability of a win against each. You win the tournament if you win two games in a row, and you want to maximize the probability of winning. Show that it is optimal to play the weakest opponent second, and that the order of playing the other two opponents does not matter.

4. *Problem 1.14.* We roll two fair 6-sided dice. Each one of the 36 possible outcomes is assumed to be equally likely.

(a) Find the probability that doubles are rolled.
(b) Given that the roll results in a sum of 4 or less, find the conditional probability that doubles are rolled.
(c) Find the probability that at least one die roll is a 6.
(d) Given that the two dice land on different numbers, find the conditional probability that at least one die roll is a 6.

5. *Problem 1.16.* We are given three coins: one has heads on both faces, the second coin has tails on both faces, and the third coin has heads on one face and tails on the other face. We choose a coin at random, toss it, and observe that the result is heads. What is the probability that the opposite face of that coin is tails?

6. Consider the experiment of rolling a 6-sided die twice and observing the result which is the sum of both tosses. Assume that the die is fair.

(a) What is the probability that the sum of both tosses is equal to 7?
(b) How do we experimentally observe this probability that you calculated in part a? We use an actual die, roll it twice, and keep track of the times when the sum of the two tosses for each two-throws of the die equals 7. After many, many tosses, we add up the number of times we obtained a sum of 7 and divide this by the total number times that we conducted the experiment (*i.e.*, threw the die twice). We call this the *relative frequency.* This can be tedious... Write a $MATLAB$ code that will calculate this probability for 1000, 2000, 4000, 10000, 100000 and 1000000 tosses. Use the function *rand* to generate (integer) random numbers between 1 and 6 (emulating a die toss). Tabulate your results showing, for each of the 6 cases, the total number of times that the sum of the two tosses equaled 7 AND the relative frequency. What do you observe as the number of tosses increases? Include your code with your answer. (*Note: The code is simple: you need at most 6 or 8 lines.*)