Math 352, Homework Set #1.

1. If you are rolling one fair dodecahedral (12-sided) die, what is the probability that you roll a prime number? Assume that the faces of this die are labelled 1 through 12.

2. Being a self-professed Lord of the Rings fan, I surveyed 50 fellow aficionados about their preferences. I found out that 34 enjoyed Peter Jackson’s films, 38 enjoyed J.R.R. Tolkien’s original work, and of these people 22 enjoyed both versions.
   What is the probability that one of these people like neither the book nor the film?

3. Show that
   \[ P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C) \]
   from using the corresponding statement for two events.

4. Suppose that you have a square whose sides have length 2 ft. Create a new tilted square by connecting the midpoints of each of the sides of the original square. Using this as a target board, where any point is equally likely, what’s the probability of missing the tilted square?

5. Pixar Animation Studios has released 12 feature films. Due to time constraints due to final examination week, there is only time for a movie marathon consisting of 4 Pixar films.
   (a) How many ways can you watch 4 Pixar movies in a row, accounting for possible multiple viewings?
   (b) How many ways can you watch 4 Pixar movies in a row, without watching any one film more than once?
   (c) How many ways can you watch any group of 4 Pixar movies?
   (d) What is the probability of watching four different Pixar movies if two of them are Ratatouille and The Incredibles?

6. In Batman lore, it is well known that Two-Face (Harvey Dent) makes his decisions by tossing his lucky coin. Since his lucky coin is also disfigured, suppose that it now comes up heads 55% of the time. What is the probability that when Two-Face tosses his coin 5 times in a row, it only comes up tails 2 times?

7. What’s the probability of answering at least 2 of 10 true/false questions correctly? Assume that for each question, being true or false is equally likely. (Using complements may be useful.)