Homework 14: Hypergeometric and Geometric Distributions

1. To demonstrate his benevolence, Darth Vader decides to use the Death Star to randomly destroy six of the twelve planets of the Dagobah system (rather than all twelve, as suggested by the Emperor). Four of the twelve planets harbor life.

   (a) Find the probability that at least three of the four planets harboring life are destroyed.

   (b) Find the expected number of planets harboring life that will be destroyed.

   For both parts, you should ignore the fact that Yoda lives in the Dagobah system.

2. Because of his past convictions for fraud and forgery, Charles has a 30% chance each year of having his tax returns audited. What is the probability that he will escape detection for at least three years?

3. Max is applying for a driver's license. Write the formula for $f_X(x)$, where X is the number of tries that he needs in order to pass the driving test. Assume that his probability of passing the driving test on any given attempt is 0.10.

4. Country A inadvertently launches ten guided missiles – six armed with nuclear warheads – at country B. In response, country B fires seven antiballistic missiles, each of which will destroy exactly one of the incoming rockets. The antiballistic missiles have no way of detecting, though, which of the ten rockets are carrying nuclear warheads.

   (a) Find the probability that country B will be hit by at least two nuclear missiles.

   (b) Find the expected number of nuclear missiles that will hit country B.