Exercise 7: Geometric Distribution, hypergeometric Distribution and Poisson Distribution

1. Suppose that an ordinary six-sided dice is role repeated, and the outcome (1,2,3,4,5,6) is noted on each roll. What is the probability that the third 6 occurs on the seventh roll?
2. Products produced by a machine has a 3% defective rate. What is the probability that the first defective occurs in the fifth item inspected?
3. From (2) what is the probability that the first defective occurs in the first five inspections?
4. Suppose J owns a lightbulb manufacturing company and determines that 3 out of every 75 bulbs are defective. What is the probability that J will find the first faulty lightbulb on the 6th one that he tested?
5. From (4), what if J wants to know the likelihood that it takes at least six trials until he finds the first defective lightbulb?
6. From (4) determine the number lightbulbs we would expect J to inspect until he finds his first defective, as well as the standard deviation.
7. Suppose that a researcher goes to a small college with 200 faculty, 12 of which have blood type O-negative. She obtains a simple random sample of n=20 of the faculty and finds that 3 of the faculty have blood type O-negative. Is this experiment a hypergeometric probability experiment? List the possible values of the random variable X, the number of faculty that have blood type O-negative.
8. From (7) What is the probability that 3 of the faculty have blood type O-negative? What is the probability that at least one of the faculty has blood type O-negative?
9. A household receives an average of 1.7 pieces of junk mail per day. Find the probability that this household will receive exactly three pieces of junk mail n a certain day. Use the Poisson probability distribution formula.
10. On average, 20 households in 50 own answering machines. Using the Poisson formula, find the probability that in a random sample of 50 households, exactly 25 will own answering machines.