

Some practice for the Binomial and Hypergeometric Distributions

- 1) Consider a hat with four slips of paper labeled A and six slips of paper labeled B. Your goal is to count the number of A's drawn.
 - a) You are drawing three slips of paper one at a time from the hat and return them between draws. Construct a tree diagram and use it to determine the probabilities of each possible outcome.
 - b) You are drawing three slips of paper one at a time from the hat without returning them between draws. Construct a tree diagram and use it to determine the probabilities of each possible outcome.
 - c) Using the definition of a hypergeometric and binomial experiment, identify each of a and b as either hypergeometric or binomial.
 - d) Match the values you got from a and b with the values you would get by using the appropriate p.m.f.

- 2) The department photo-copier has a 1 in 20 chance of jamming for each piece of paper put through.
 - a) Using J for jam and O for non-jam, give the sample space for the next four sheets of paper to go through.
 - b) What is the probability of observing JOOO?
 - c) What is the probability of observing OJOO?
 - d) How many distinctive ways can you arrange one J and three O's?
 - e) Why are each of the distinct arrangements disjoint?
 - f) What is the probability of observing 1 jam in the next four sheets? (Does this match what the binomial pdf gives?)
 - g) What is the expected number of jams in the next four sheets?

- 3) A class of 24 students contains 15 women and 9 men. Six of these students are to be chosen at random for a demonstration in front of the class.
- a) How many ways can 1 man be chosen from a group of 9?
 - b) How many ways can 5 women be chosen from a group of 15?
 - c) How many ways can a group of 1 man and 5 women be chosen from a larger group of 9 men and 15 women?
 - d) How many ways can six students be chosen from a group of 24?
 - e) What is the probability that the group of six students chosen will have only 1 man? (Does this match the probability from the hypergeometric p.m.f.?)
- 4) Consider a population of size N containing Np defectives. A sample of size n is to be chosen without replacement.
- a) Is this a hypergeometric or binomial?
 - b) Give the mean and standard deviation of the number of defectives contained in the sample.
 - c) What happens to these values as N increases?