Name: ____________________________ Group ______

1) For each of the following situations, determine i) Is the distribution a Bernoulli, why or why not? If it is a Bernoulli distribution then ii) What is a failure and what is a success? iii) Determine the values of p and q. iv) Calculate the expected value and the variance. If the distribution is not a Bernoulli, how would you change the question so that it is a Bernoulli distribution?

a) Rolling a fair 4-sided die and observing whether the number showing is a 1 or not.

b) The number of births of girls in a county hospital on any specific day.

c) In quality control we want to see if a particular product is ‘defective’. We take random samples from an assembly line and check each sample to see if the product is defective. Overall, the 1% of the plant's products are defective.

d) A basketball player makes 75% of her free throws. We want to know how many trials it takes until she misses a free throw.

e) In a drug trial, some patients with the same condition are given a drug and some are given a placebo to see if the drug is effective or not. It can be assumed that the drug is 80% effective.

2) Suppose that 1% of Blu-Ray discs produced by a company are defective. You buy one of these discs and check to see if it is defective.

a) What do you consider a “success” in this story? What is the probability?

b) What do you consider a “failure” in this story? What is the probability?

c) Why is this a Bernoulli situation? What is the parameter?

d) Define X in terms of this story. What values can X take?

e) Draw the labeled graph of the mass for this story.

f) Draw the labeled graph of the CDF for this story.

g) What is the expected value of the number of defective Blue-Ray disks?

h) What is the standard deviation of the number of defective Blue-Ray disks?

3) In each case, identify whether the situation is binomial are not. If it is binomial, state what the parameters are, n and p. In addition, state what is meant by a success and what the random variable, X, corresponds to. If the situation is not a binomial, rephrase the question so that it will be a binomial distribution and provide n, p, what is meant by a success and what X corresponds to.

a) Rolling a fair 4-sided die 5 times and observing whether the number showing is a 1 or not.

b) In quality control we want to see if a particular product is ‘bad’. One machine has a probability of 1% of making a defective part. We take 10 random samples from an assembly line that uses different machines to produce the product.

c) Approximately 8.33% of men are colorblind. You survey 8 men from a population of a large city and count the number who are colorblind.

d) We draw 2 cards from a standard deck without replacement. We are interested in knowing if the cards are red or not.

e) In Edinburgh Scotland, approximately 29% of the people have green eyes, 57% have blue eyes and 14% have brown eyes. We randomly select 10 people from Edinburgh and record their eye color.

4) A restaurant serves eight entrées of fish, 12 of beef, and 10 of poultry. Let X be the number of times that one of the next four customers orders fish. Assume that all customers order independently from each other.

a) Why is this a binomial distribution? What is a success? What are the parameters?

b) Explain in words what X is in this situation and what values can it take?

c) What is the probability that exactly two of the next four customers order fish entrées?

d) What is the probability that at most one of the next four customers' orders fish?

e) What is the probability that at least one of the next four customers' orders fish?

f) How many customers would the restaurant have to serve to be sure that there is a 90% chance that at least one of them orders a fish entrée?

g) What is the expected number of customers (in the next 4 customers) that will order fish?

h) What is the standard deviation of the number of people who order fish?

5) For the situation in Problem 4,

a) Show a labeled graph of the mass of this story.

b) Show the labeled graph of the CDF for this story.

6) At a certain point in a card game, if you get spade, you win $4, if you get a 2 (except the 2♠), you lose $5, if you get the A♥, you win $20, and if you get any other card, the game ends with no money being exchanged.

a) What is your expected gain or loss?

b) You and 3 friends are playing using the rules above each using your own deck. We are interested if a player receives any of the cards listed.

i) What is the expected value of the number people getting one of the above cards?

ii) What is the variance of the number of people getting one of the above cards?

7) On a certain highway, 7% of the vehicles have 18 wheels and the other 93% of the vehicles have 4 wheels. (We ignore motorcycles, etc., for simplicity.) A child looks out the window and counts the wheel son the next vehicle to pass.

a) What is the expected number of wheels?

b) What is the variance of the number of wheels?

8) A cereal company puts a Star Wars toy watch in each of its boxes as a sales promotion. Twenty percent of the cereal boxes contain a watch with Obi Wan Kenobi on it. You are a huge Obi Wan fan, so you really want one of these watches.

a) You decide to buy 100 boxes of cereal from the warehouse store to be on the safe side. What is the probability you don't find any Obi Wan watches?

b) What is the expected number of Obi Wan watches you will find in the 100 boxes?

c) If each box of cereal costs $3.50, and you believe the value of an Obi Wan watch will be approximately $50 in a few years, are you doing a smart thing by purchasing 100 boxes? (Think about the expected value for the cost and the profit.)

d) How many boxes of cereal would you need to buy to be at least 95% sure of finding at least 1 Obi Wan watch?