Name: _____ Group _____

1. For each of the following situations, state which distribution (and approximate distribution, if applicable) would be most appropriate, and why you think so. If this is a distribution that we have not discussed in class, state 'none.' If this is a named distribution, write the mass function and state the parameters. If this is an approximate distribution, explain why the approximate is valid.

a. Let X be the number of ice cream cones you need to sample in order to find your first broken one if they come from a large, independent population and 12% of the cones in the entire population are broken.

b. Let X be the number of ice cream cones that you need to sample to find the 2nd waffle cone and the 3rd regular cone if they come from a large, independent population and 10% of the waffle cones are broken and 15% of the regular cones are broken.

c. Let X be the number of broken ice cream cones in your sample if you check 30 from a box (without replacement). Twelve are broken out of the 100 in the box total.

d. Let X be the number of ice cream cones you need to sample from a large population in order to find your 4th broken one, if they come from a large independent population, and 12% of the cones in the entire population are broken.

e. Let X indicate whether the next ice cream cone is broken if 12% of the cones in a large, independent population are broken.

f. Let X be the number of ice cream cones in your sample which are broken if you sample 50 of them from a large, independent population, and 12% of the cones in the entire population are broken.

g. Let X be the number of ice cream cones in your sample which are broken if you sample 50 of them from 2 boxes, one of which was roughly handled and the other was handled normally. Assume that 12% of the cones from the plant are broken and handling the box roughly breaks an additional 2%.

h. Let X be the number of undercooked ice cream cones in your shipment of 10,000 if you sample from a large population. Undercooked ice cream cones have a 0.005% chance of occurring in general.

i. Let X be the number on the box you randomly select, if you are choosing 1 box from 7 numbered boxes of ice cream cones.

j. Let X be the number of broken cones you would find in the next hour if broken cones come down the assembly line at a rate of 2 broken cones per minute.

k. Let X be the number of broken ice cream cones in your sample if you check 30 from a shipment (without replacement). The lot has 1200 broken cones out of a total of 10,000.

For the next 3 questions: besides answering the question, state which distribution you are using and the parameters.

2. According to past experience, 20% of customers coming into Frank's car dealership will buy one of his cards. Assume customers are independent and sampled from a very large population. Assume his dealership is open 7 days a week.

a. What is the probability the next person who walks in the door will buy a car?

b) If 10 customers come in to the dealership today, what is the probability at least 2 of them will buy cards?

c) What is the probability that the 4^{th} customer coming in today is the first one who will buy a car?

d) What is the expected number of customers he needs to come into the dealership to sell his 3^{rd} car?

e) If customers are equally likely to want to buy cars painted red, brown, blue, black, or white, what is the probability that the next customer who busy a car picks a black car?

3. On average, 9 babies are born per 24-hour day at the local hospital.

a) What is the probability that at least one baby will be born today on the 8 am to 4 pm shift?

b) What is the probability that exactly 4 babies will be born on the 8 am to 4 pm shift?

c) What is the probability that exactly 4 babies will be born on each of the next three 8-hour shifts?

d) What is the probability that you would have to wait for four 8-hour shifts until you got the first one with exactly 4 babies born?

4. There are 5 juniors and 10 seniors (one of which is Amelia), trying to win a scholarship to a summer music program. Only 3 students can win, and the winners will be selected randomly by pulling names out of a hat.

a) If no one can win more than once, what is the probability that all 3 winners will be seniors.

b) If student can win more than once and the students are independent from each other, what is the probability that all 3 winners will be seniors?

c) If student can win more than once and the students are independent from each other, what is the probability that the name-puller will call the first senior on the third name?

d) What is the probability that the first person to win a scholarship is a senior?

e) What is the probability that the third person to win a scholarship is a senior?