STAT 50 MIDTERM #2 FALL 2019 NAME:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SHOW ALL WORK! CALCULATOR FOR ARITHMETIC ONLY!

1. Suppose the force acting on a column that helps to support a building is a normally distributed random variable with mean value 15.0 kips and standard deviation 1.25 kips. Compute the following:

1. Given , find .

2. Bill Connors, a quality control manager at a Menlo Park Electronics Company, knows that his company has been making surge protectors with a rate of defective units one-in-nine. Bill decides to test 18 randomly selected surge protectors to see how many are defective. Let X represent the number of defective units among the 18. Assuming independence, answer the following:

1. What expected number of defective surge protectors?

1. What is the probability that at least one surge protector is defective?

3. The lifetime of a microprocessor is exponentially distributed with a variance of 4,000,000 hours.

1. What proportion of microprocessors will function for less than 5,000 hours?
2. A microprocessor has been functioning for 1,000 hours. What is the probability that it will function for a total of at least 6,000 hours?

4. Suppose small aircraft arrive at a certain airport according to a Poisson process with a mean rate of 8 per hour.

1. Let be the waiting time until the 4th aircraft arrives. Identify the distribution of , including any parameters, and find .
2. Let be the number of aircraft that arrive during a one-half hour period. Identify the distribution of , including any parameters, and find .

5. Among the income-tax forms filed in a certain year, the mean tax paid was $2,000 and the standard deviation was $500. A random sample of 625 forms is drawn. Let be the mean tax paid on the sample of 625 forms.

1. What will you use for the distribution of , including any parameters? Explain!!!
2. What is the probability that the mean tax paid on the sample forms is greater than $1,980?

6. A process that fills packages is stopped when the fourth package is detected whose weight falls outside the specification. Assume that each package has probability 0.01 of falling outside the specification and that the weights of the packages are independent. Let represent the number of runs required until the process is stopped.

1. Identify the distribution of , including any parameters.
2. What is the expected number of runs required until the process is stopped?

7. Of customers ordering a certain type of personal computer, 25% an updated graphics card, 30% order extra memory, 15% order both the upgraded graphics card and the extra memory, and 30% order neither. Twelve orders are selected at random, Let denote the respective numbers of orders in the four given categories.

1. Find . You do not need to provide a decimal answer.
2. Identify the distribution of , and find . You do not need to provide a decimal answer.

8. In a lot of 100 microcircuits, 20 are defective. Four microcircuits are chosen at random to be tested. Let denote the number of tested circuits that are defective.

1. Identify the distribution of , including any parameters, and find . You do not need to provide a decimal answer.
2. If appropriate (check), estimate using an appropriate method.

9. One piece of PVC pipe is to be inserted inside another piece. The length of the first piece is normally distributed with a mean value 20 in. and standard deviation .5 in. The length of the second piece is normally distributed with mean 15 in. and standard deviation .4 in. The amount of overlap is normally distributed with mean 1 in. and standard deviation .1 in. Assuming that the lengths and amount of overlap are independent of one another, what is the probability that the total length after insertion is between 34.5 in. and 35.1 in.?

10. Resistors are labeled . In fact, the actual resistances are uniformly distributed on the interval [96,102].

1. Find the probability that the resistance is between 97 and 100.
2. Suppose that resistances of different resistors are independent. What is the probability that two out of seven resistances are between 97 and 100?

11. It can be shown that if the random variable represents the time to the rth event in a Poisson process with rate parameter , then has a Gamma distribution with parameters r and . That is, . Assuming , find in each of the following ways:

1. By integrating the Gamma pdf from 0 to 2 (recall When r is an integer). See section 4.8 if you don’t recall the pdf.
2. Using the formula , where .