STAT 2507 Assignment # 3 (Chapter 5) Winter 2013
Due in class or online: Sections D&E, March 12 ; Section F March 13.

Last Name ——————————————- , **First Name** ——————————-

Student # ——————————————**Lab group:**————————

Total of marks=100.

Part I. Lab questions. Use only the blanks left to answer lab questions.

1. Suppose that X has a binomial distribution with $n = 16$ and $p = 0.7$. Use minitab to simulate 20 values of X.
   random 20 c1;
   binomial 16 0.6.
   i) [5] How many of your values are less than 17?20

   ii) [5] How many of your values are between 8 and 13 inclusive?11 (may vary)

   iii) [5] If Y has a binomial distribution with $n = 12$ and $p = 0.4$, use the *cdf* command, (it gives you the value of $P(Y \leq k)$), which works by typing
   cdf;
   binomial 12 0.4.
   to calculate: $P(Y < 9) =$0.98473, and $P(9 \leq Y \leq 10) =$.01495

   iv) [5] If you simulate 100000 values of Y, what would be the expected number of values (among the 100000 values) that are less than 10?9972

2. Suppose that X has a Poisson distribution with mean $\mu = 16$. Use the *cdf* command
   cdf;
   poisson 16.
   to answer the following questions:

   [5] $P(X < 10) =$ 0.04330, [5] $P(9 \leq X \leq 11) =$0.08369-.

   [5] The expected number of values (among the 100000 values) that are less than 10 is 433.

3. Suppose that Y has a hypergeometric distribution with parameters $N = 20$, $M = 9$, and $n = 6$. Use the command
cdf 3 ;
hypergeometric 20 9 6.
to find [5] $P(Y \leq 4) =$ 0.962074 and [5] $P(Y > 4) =$ 0.037926.

Long answer questions. Use blank left to answer each question.

1. A case of wine has 15 bottles, 5 of which contain spoiled wine. A sample of 6 bottles is randomly selected from the case.
i) [6] What is probability that the sample contains 2 bottles of spoiled wine?

Let X be the number of spoiled bottles. Then X has Hypergeometric distribution with N=15, M=5, n=6. So P(X=2)= (5 choose 2)x(10 choose 4)/(15 choose 6)= 0.419580

ii) [7] What is probability that all 6 of the sampled bottles are spoiled?

zero since the maximum of spoiled we can get is 5. Impossible to get all the six spoiled.

iii) [7] What are the mean and variance of the number of spoiled bottles in the sample?

E(X)=n(M/N)=6(5/15)=2.
V(X)=n(M/N)((N-M/N))((N-n))/(N-1)=6(5/15)(10/15)(9/14) =.857.

2. The number of flaws on a VHS magnetic tape produced continuously at a factory follows a Poisson distribution with an average of 0.02 flaws per meter. A standard VHS cassette tape contains 300 meters of magnetic tape.
i [7] What is the probability that there are at least three flaws in a single VHS cassette tape?

Let X be the number of flaws in a single VHS. Then X has Poisson distribution with μ=300x02=6. P(X≥3)=1-P(X≤2)=1-.062=0.938.

ii [7] What is the probability that there are no flaws in a single VHS cassette tape; that is, a tape is flawless?

P(X=0)=e^(-6)=.0025.

iii [7] In a random sample of 20 cassettes, what is the probability that at least two of them are flawless?

Let Y be the number (out of 20 cassettes) of flawless cassettes. Then Y has binomial distribution with n=20 and p=.0025. So P(Y≥2)=1-P(Y≤1) =1-0.9988476=0.0011524

3. A box of candy contains 25 pieces. Twenty are made of chocolate and five are made of vanilla.
i [7] Five pieces are selected at random without replacement. What is the probability that three of them are chocolates?

The number X of chocolates has hypergeometric with N=25, M=20, n=6, and P(X=3)=(20 choose 3)(5 choose 2)/(25 choose 5)= 0.214568.

ii [7] What would be the answer to part (i) if the five pieces are selected at random with replacement (i.e., a selected piece is put back in the box before the next selection is made)?

The X will have binomial distribution with n=5, p=20/25=.8. So P(X=3)=(5 choose 3)(.8)^3(.2) ^2=0.2048.