STAT 2507 Assignment # 2 (Chapter 4,5,6) Summer 2015

Last Name ——————————————- , **First** ——————————-
Student # ——————————

Due: July 08 2015, prior to the start of class **Total mark=100**

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

1. (Mean and variance of random variables using Minitab)
   The values (1 to 10) in the first column of the Open Office file are the values that random variable x takes (copy and paste them in C1 of your Minitab worksheet) and the second column contains $p(x)$ (copy and paste this column from Open Office file in C2 of your Minitab worksheet)

   (a) [2] Obtain the mean of x, i.e., $\mu = E(x)$ by $Calc \rightarrow Calculator \rightarrow sum(C1 * C2)$. What is μ? _____.

   (b) [2] by clicking $Calc \rightarrow Calculator \rightarrow sum((C1 * *2) * C2) - (sum(C1 * C2)) * *2$. obtain $Var(x) = \sigma^2$. What is σ^2 ? _____. What is σ? _____.

   (c) [2] Calculate the interval $(\mu - 2\sigma, \mu + 2\sigma)$? _____.

   (d) [2] What values of x are inside the interval in part (c)? _____.

2. Suppose that X has a binomial distribution with n=25 and p=0.8. Use minitab to simulate 25 values of X.

   random 25 c1;

   binomial 25 0.8.

   (i) [2] How many of your values are less than 21? _____.

   (ii) [2] How many of your values are between 21 and 24 inclusive? _____.

   (iii) [2] If Y has a binomial distribution with n=23 and p=0.8, use the 'cdf' command, (it gives you the value of $P(Y \leq k)$),

cdf;

binomial 23 0.8.
to calculate: $P(Y < 18)$=_____. and $P(18 \leq Y \leq 22)$=_____.

(iv) [2] If you simulate 10000 values of Y, what would be the expected number of values (among the 10000 values) that are less than 18? _____.

3. Suppose that X has a Poisson distribution with mean μ=25. Use the 'cdf' command

cdf;

poisson 25.
to calculate: $P(X < 18)$=_____. [2] and $P(18 \leq X \leq 22)$=_____. [2] The expected number of values (among the 10000 values) that are less than 18 is _____. [2]

4. Suppose that Y has a normal distribution with mean μ=35 and variance σ^2=4. To find $P(Y \leq b)$, where b is any fixed constant, use the 'cdf' command

cdf b;

normal 35, 2.
To find '?' that satisfies $P(Y \leq ?) = a$, where a is a fixed know number between 0 and 1, use the 'invcdf' command

invcdf a;

normal 35, 2.
To simulate 20 observations from the distribution of Y, and put them in c1, in minitab:

random 20 c1;

normal 35 2.
(i) [2] Use minitab to find the probabilities $P(Y \leq 33)$=_____. [2], $P(Y > 36)$=_____. and $P(33 \leq Y \leq 36)$=_____. .

(ii) [2] What is the value of c in $P(Y \leq c)$= 0.25? _____.

(iii) [2] Simulate 20 observations from the distribution of Y and use the 'describe' command to find the mean, $\bar{x}$, and the standard deviation s for these 20 values. How many of the values

fall in the interval $\bar{x} \pm 2s$? _____. . Based on the Empirical rule, what proportion of the observations fall in this interval? _____.

5. In this exercise we look at the distribution of the linear combination of normal random variables. Simulate 200 observations from a normal distribution with μ=20 and σ=5 into c1. Simulate another 200 with μ=7 and σ=1 into c2. Then compute the following:

   *let c3=3*c1*

   *let c4=2*c2*

   *let c5=3*c1+10*

   *let c6=2*c2+5*

   let c7=c1+c2

   *let c8=3*c1+2*c2+3*

   Now use the minitab commands 'describe c1-c8' and 'histogram c1-c8'. Try to find out how the means and standard deviations of various columns (c1, c2, ...) are related. [Note: 'describe' provides you with the Mean $\bar{x}$ and standard deviation s (StDev in the output).] More specifically:

   (i) [2] The mean $\bar{x}$ and the standard deviation s for the observations in c3 are _____. and _____. respectively.

   (ii) [2] What is the distribution of the variables in c3?

   (a) Normal; μ=60; σ=5 (b) Normal; μ=20; σ=5

   (c) Normal; μ=20; σ=15 (d) Normal; μ=60; σ=15

   (iii) [2] What is the distribution of the variables in c6 ?

   (a) Normal; μ=14 ; σ=2 (b) Normal; μ=19; σ=2

   (c) Normal; μ=19; σ=7 (d) Normal; μ=14 ; σ=6

   (iv)[2] What is the distribution of the variables in c8 ?

   (a) Normal; μ=74 ; σ=$\sqrt{227}$ (b) Normal; μ=77; σ=$\sqrt{229}$

   (c) Normal; μ=77; σ=17 (d) Normal; μ=77 ; σ=20

Part II Comprehension questions

1. A student is preparing for an upcoming exam. The professor for the course has given the class 30 questions to study from and plans to select 10 of the questions for use on the actual exam. Suppose that the student knows how to solve 25 of the 30 questions.

   (a) [3] What is the probability that the student will get perfect on the test?

   (b) [3] What is the probability that the student will get at least 9 questions correct on the test?

2. Twenty persons reporting to a Red Cross center one day are typed for blood, and the following counts are found:

Blood group	O	A	B	AB	Total
No. of persons	7	4	6	3	20

   If one person is randomly selected, what is the probability that this person's blood group is:

   (a) [1] AB?

   (b) [1] Either A or B?

   (c) [1] O and B?

   (d) [1] Not O?

   (e) [2] A given that his blood is Not O?

3. A survey has revealed that 75% of all college students study. It is also known that 85% of all students who study will graduate, while only 35% of those students who do not study will graduate.

   (a) [4] If a student is randomly selected, what is the probability that he or she will graduate?

   (b) [3] A randomly selected student is observed to graduate. What is the probability that this student studied?

4. For events A and B we have

$$P(A) = 0.3,\ P(B) = 0.8,\ P(A \cup B) = 0.9$$

(a) [3] Find $P(A|B)$, $P(A' \cap B)$ and $P(B' \cup A')$.

(b) [2] Are A and B independent? Why?

5. A random variable X can assume five values: $0, 1, 2, 3, 4$. A portion of the probability distribution is shown here:

x	0	1	2	3	4
p(x)	0.2	0.1	0.1	?	0.3

(a) [1] Find p(3).

(b) [1] Calculate the population mean, variance, and standard deviation.

(c) [2] What is the probability that X is strictly greater than 1;

(d) [2] What is the probability that X is less than 3 and greater than 1;

(In parts (a)-(d) show steps of your calculations)

6. A student is preparing for an upcoming exam. The professor for the course has given the class 30 questions to study from and plans to select 10 of the questions for use on the actual exam. Suppose that the student knows how to solve 25 of the 30 questions.
i) [3] What is the probability that the student will get perfect on the test?
ii) [3] What is the probability that the student will get at least 8 questions correct on the test?

7. A certain brand of computer disks averages 0.1 missing pulse per disk. Let the random variable X denotes the number of missing pulses.
i) [1] What is the distribution of X?
ii) [2] Find the probability that the next inspected disk will have no missing pulse.
iii) [2] Find the probability neither of the next two disks inspected will contain any missing pulse.

8. [5] An airline finds that 5% of the persons making reservations on a certain flight will not show up for the flight. If the airline sells 160 tickets for a flight that has only 155 seats, what is probability that a seat will be available for every person holding a reservation and planning to fly.

9. In a certain exam, the grades are normally distributed with mean grade of 75 and a variance of 64. Students with marks 90 or over receive grade A+ .
   i) [2] What percentage of students received A+?
   ii) [3] If 12 students write the exam, what is the probability that 3 of them get A+ ?

10. [5] The batting average off all players in a professional baseball league is normally distributed with the mean of 0.27 and standard deviation of 0.01. A players' contract comes of for renewal. In order to have a good bargaining position, he would like to have a batting in the top 1% of all players. What batting average must be attain?

11. Twenty percent of all cars manufactured by a certain company have a defective transmission system.
   i) [4] If a dealer has sold 10 of these cars, what is the probability that it will need to service 2 of them?
   ii) [4] If a dealer has sold 200 of these cars, what is the probability that it will need to service at most 50 of them?