ADM2303X

Prof: Dr. Suren Phansalker   (100 Marks)   **Assignment#4**

N.B.:

   1. **Due Date: Friday, July 20th, 2012.**
   2. **You MUST Upload the Assignment on MyStatLab in "pdf" format before 23:59 hrs.**
   3. **You MUST also attach the Printed/ Signed "Integrity Statement".**
   4. **You must always use 4 Decimal Digits (DD) level of precision and show all your work. Simply writing answers will result in minimum or even zero credit.**
   5. **Assignment#4, Part 1 is already posted on MyStatLab.**

Qu.#1 (16 Marks)

   a. The number of service calls, in any time interval is, Poisson distributed. In 4 hours, the mean # of service calls is 2. Find the probability that:
   i.   In a 4 hour time interval, there would be exactly 3 service calls.
   ii.   In one 4 hour time interval there would be exactly 3 service calls and in the next 4 hour time interval there would be no service calls.
   b. Now consider an 8 hour time interval. Find the probability that:
   i.   In 8 hour time interval, there would be exactly 3 service calls.
   ii.   Compare the answer to part 'i' in 'b' to part 'ii' in 'a'. Why are they different? Explain in words without any formulas or calculations.

Qu.#2 (28 Marks)

The population mean of the weight of males in a given community is estimated to be 195 lbs with a standard deviation of 25 lbs. The distribution of the weight is **not known**.

   a. If a simple random sample of size 100 was taken, find the probability that
   i.   The sample mean would be more than 200 lbs.
   ii.   The sample mean would be less than 192 lbs.
   iii. The sample mean would be between 193 and 198 lbs.
   iv.   What justification do you have to use the approach you have taken to answer the above sub-questions? Explain briefly.

   b. What would be the probability that a sample mean would be more than 202 lbs? Would you consider this very likely to happen? If this event did happen, what would be your considered opinion about the assumed value of the population mean?
   c. If two independent random samples of size **100** each were taken, find the probability that:
   i.   Both the sample means would be more than 200 lbs.
   ii.   One sample mean would be more than 200 lbs and the other one would be less than 192 lbs.
   d. With this unknown distribution, could you have calculated any of the probabilities that you found in parts 'a', 'b', or 'c' if the sample size was only 16? Explain clearly.

Qu.#3 (30 Marks)

Now consider the situation where the population mean of the weight of males in a given community is still estimated to be 195 lbs but the standard deviation is unknown. It was estimated with a simple random sample of size 16 and calculated as 20 lbs. The weight is, however, now **normally** distributed.

   a. For the above random sample, find the probability that the sample mean:
   i.   Would be more than 200 lbs.

ii.   Would be less than 192 lbs.
iii.   Would be between 193 and 198 lbs.
iv.   What justification do you have to use the approach you have taken to answer the above sub-questions?
v.   Why are the values you obtained in this question different from the values you obtained in Qu.3 part 'a'? Explain in brief.

b. If two independent random samples of size 16 each were taken and if both had sample standard deviations of 20 lbs, find the probability that:

i.   Both the sample means would be more than 200 lbs.
ii.   One sample mean would be more than 200 lbs and the other one would be less than 192 lbs.

Qu.#4 (26 Marks)

In a given city, the population proportion of people who are obese is 30%. A random sample of size **100** is taken. If RV 'X' indicates the # of obese people,

a. What is the exact distribution function applicable to this problem? Why? Explain in brief.
b. Find the exact probability that 25 or less number of people is obese. Use MiniTab.
c. What is the approximate distribution function which you can apply to the situation above. Are the required conditions satisfied? Justify your answer.
d. What is the probability that 25 or less number of people is obese? Use the approximate approach. Compare this answer to the answer in part 'b' and comment.
e. Use the theory of distribution of sample proportion, $\hat{p}$ (see p-1 in "Week11Pr2303" file) , to find:

i.   The probability that the sample proportion is greater than 35%.
ii.   The probability that the sample proportion is between 27% and 33%.
iii.   The probability that the sample proportion is less than 20%.

f. If the sample size were **15**, find the probability that the sample proportion would be less than 20%. Why did you find the probability the way you did? Explain in brief but clearly.