KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS AND STATISTICS
Term 152

Final Major Exam

STAT 211 BUSINESS STATISTICS I

Wednesday May 11, 2016

Serial number

Please circle your instructor name:

W. Al- Sabah M. Saleh

Name: ____ ID #:____________________________

Important Note:

- Show all your work including formulas, intermediate steps and final answer

Question No	Full Marks	Marks Obtained
1	15	
2	3	
3	4	
4	7	
5	8	
6	7	
7	5	
8	6	
Total	55	

Q1: The following observations are the sales for a big mall in 100,000 of SR for the previous 20 months

1.91	1.92	1.93	1.95	2	2	2.01	2.05	2.07	2.09
2.09	2.1	2.12	2.15	2.16	2.24	2.27	2.28	2.3	2.33

Given that $\sum_1^{20} x = 41.97$, $\sum_1^{20} x^2 = 88.4059$

a. Construct a stem and leaf plot for the data, comment on the shape. (*3 pts.*)

b. Which value is better measure of the central tendency of these data? Explain. (*2 pts.*)

c. Find the 60th percentile, then find the standardized value of your answer. (*5 pts.*)

d. If the population mean is RS 250000, find the sampling error, and how you can reduce it. (*2 pts.*)

e. Assume that the population of the sales normally distributed. Construct a 98% confidence interval to estimate the population mean. (3 *pts.*)

Q2: The following distribution represents how many cars will pump gas at a service station in hour

Number of cars	0	1	2	3	4	5
Probability	0.03	0.17	0.2	0.33	0.1	0.17

a. Find the probability that more than 3 cars receive gas. (*1 pt.*)

b. What is the expected number of the cars that will pump gas? (2 *pts.*)

Q3: Assume that customers enter a store at the rate of 120 persons per hour according to a Poisson process.

a. What is the probability that during two minute interval no one will enter the store? (*2 pts.*)

b. Find the probability that it takes less than three minutes between any two arrivals to the store. (*2 pts.*)

Q4: A national survey research firm has past data that indicate that the interview time for a consumer opinion has a standard deviation of 6 minutes.

a. How large a sample should be taken if the firm desires a 95% confident of estimating the mean interview time to be within ± 2 minutes? (*2 pts.*)

b. Assume that the simple random sample you recommended in part (a) is taken and that the mean interview time for the sample is 32 minutes. What is the 93% confidence interval estimate for the mean interview time for the population of interviews? (*3 pts.*)

c. Without performing any additional calculations, would a 99% confidence interval for the mean interview time for the population interviews be shorter or longer than the one obtained (b)? Justify your answer in words. (*2 pts.*)

Q5: The owner of a Bakery is interested in determining the difference between mean purchase amounts in Saudi Riyals (SR) per customer at his two locations. To estimate the difference, hi has selected a random sample of 50 customers receipts at each location. The following data are available:

	Location 1	Location 2
Sample Mean (SR)	5.26	6.19
Sample St. Dev. (SR)	0.89	1.05

Based on the sample data,

a. Calculate and interpret a 96% confidence interval estimate for the difference in mean purchase amounts. (*4 pts.*)

b. Referring to part (a), does any location perform better than the other and why? (*2 pts.*)

c. Referring to part (a), suppose the owner wishes to reduce the margin of error, what are his options? Discuss. (2 *pts.*)

Q6: A study was recently conducted at a major university to estimate the difference in the proportion of business school graduates who go on to graduate school and the proportion of engineering school graduates who attend graduate school. A random sample of 400 business school graduates showed that 75 had gone to graduate school while in a random sample of 500 engineering graduates, 148 had gone on to graduate school.

a. Construct a 96% confidence interval estimate for the difference in the proportion of business school graduates who go on to graduate school and the proportion of engineering school graduates who attend graduate school. (*5 pts.*)

b. What is the sample size needed to estimate the proportion of business school graduated who attend graduate school, to be within ± 0.02 and 95% confident? (*2 pts.*)

Q7: A soft-drink machine discharges an average of 200 milliliters per cup. If the amount of drink is normally distributed with a standard deviation equal to 15 milliliters,

a. Below what value do we get the smallest 25% of the drinks? (*2 pts.*)

b. How many cups will probably overflow if 230-milliliter cups are used for the next 1000 drinks? (*3 pts.*)

Q8: Two independent samples of sizes 5 and 6 are randomly selected from two normal populations with equal but unknown variances to estimate the difference between the mean lives of two brand of tires. The 90% confidence interval for the difference between the two population means $\mu_1 - \mu_2$ is

$$39360\ km \le \mu_1 - \mu_2 \le 65320\ km$$

then:

a. Find the point estimate of $\mu_1 - \mu_2$. (*2 pts.*)

b. Find the point estimate for the pooled variance. (*4 pts.*)

Some Useful Formulas

- $s = \sqrt{\frac{\sum x^2 - n\bar{x}^2}{n-1}}$
-
- $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- $(A \cap \bar{B}) = P(A) - P(A \cap B)$
- $P(\bar{A} \cap \bar{B}) = 1 - P(A \cup B)$
- $P(A|B) = \frac{P(A \cap B)}{P(B)}, \quad P(B) > 0$
- $P(A \cap B) = P(B)P(A|B) = P(A)P(B|A)$
- $\mu = E(X) = \sum_{i=1}^{n} x_i \, P(X = x_i),$

  $or \quad \mu = E(X) = \int x \, f(x) \, dx$
- $\sigma^2 = E(X^2) - E(X)^2$

  $\boldsymbol{P}(X = x) = C_x^n \, \pi^x \, (1-\pi)^{n-x}, \quad x = 0,1,\ldots,n,$

  $\mu = n\pi \quad \& \quad \sigma = \sqrt{n\pi(1-\pi)}$
- $\boldsymbol{P}(X = x) = \frac{(\lambda t)^x \, e^{-\lambda t}}{x!},$

  $\mu = \lambda t \quad \& \quad \sigma = \sqrt{\lambda t}$
- $P(X = x) = \frac{C_x^X \, C_{n-x}^{N-X}}{C_n^N},$

  $\mu = \frac{nX}{N} \quad \& \quad \sigma = \sqrt{\frac{nX(N-X)}{N^2}} \sqrt{\frac{N-n}{N-1}}$
- $f(x) = \frac{1}{b-a}, \quad a < x < b,$

  $\mu = \frac{a+b}{2} \quad \& \quad \sigma = \sqrt{\frac{(b-a)^2}{12}}$
- $f(x) = \lambda e^{-\lambda x}, \; x > 0, \quad \mu = \sigma = \frac{1}{\lambda}$
- $f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}, \quad -\infty < x < +\infty$

  $-\infty < \mu < +\infty \quad \& \quad \sigma > 0$
- $\bar{x} \pm z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$
- $\bar{x} \pm t_{\frac{\alpha}{2}, n-1} \frac{s}{\sqrt{n}}$
- $n = \left(\frac{z_{\frac{\alpha}{2}}\sigma}{e}\right)^2 \quad or \quad n = \left(\frac{z_{\frac{\alpha}{2}}s}{e}\right)^2$
- $p \pm z_{\frac{\alpha}{2}} \sqrt{\frac{p(1-p)}{n}}$
- $n = \left(\frac{z_{\frac{\alpha}{2}}}{e}\right)^2 p(1-p) \quad or \quad n = \left(\frac{z_{\frac{\alpha}{2}}}{e}\right)^2 \frac{1}{4}$

- $(\bar{x}_1 - \bar{x}_2) \pm z_{\frac{\alpha}{2}} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$
- $(\bar{x}_1 - \bar{x}_2) \pm z_{\frac{\alpha}{2}} \sqrt{\frac{s_1^2}{n_1} + \frac{s_1^2}{n_2}}$
- $(\bar{x}_1 - \bar{x}_2) \pm t_{\frac{\alpha}{2}, n_1+n_2-2} \; s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$

where

$$s_p = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$$

- $\bar{d} \pm t_{\frac{\alpha}{2}, n-1} \frac{s_d}{\sqrt{n}}$
- $(p_1 - p_2) \pm z_{\frac{\alpha}{2}} \sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$