KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS AND STATISTICS
Term 142

STAT 211 BUSINESS STATISTICS I

Monday May 18, 2015

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	9	
4	3	
5	5	
6	5	
7	6	
Total	46	

Q1: A random sample of size 25 sports utility vehicles (SUVs) for the same year and model revealed the following miles per gallon (MPG) values:

9.5	9.9	10	10.2	10.7	10.9	11	11.3
11.4	11.7	11.9	12	12	12.1	12.4	12.4
12.6	13	13	13.1	13.25	13.5	13.7	14
14.4							

a. Calculate the mean, the median and the first quartile MPG. (3 pts)

b. Construct a frequency histogram including the interval $[10.5, 11.5)$. (4 pts)

c. What type of shape does the distribution of the sample appear to have? (1 pt)

d. If you want to estimate the population mean MPG, using an interval estimate, do you need any assumptions? Justify your answer. (2 pts)

e. Use the sample results to develop a 93% confidence interval estimate for the population mean MPG. Comment on the confidence interval. (5 pts)

Q2: An insurance company examines its pool of auto insurance customers and gathers the following information:

- All customers insure at least one car.
- 70% of the customers insure more than one car.
- 20% of the customers insure a sports car.
- Of those customers who insure more than one car, 15% insure a sports car.

Calculate the probability that a randomly selected customer insures exactly one car and that car is not a sports car. (3 pts)

Q3: The average amount of meat that a person consumes is 218.4 pounds yearly, assume that the standard deviation is 25 pounds and the distribution is normal.

a. Find the probability that a person selected randomly consumes less than 224 pounds per a year. (2 pts)

b. If a sample of size 40 customer's is selected at random, fin the probability that the sample mean will be between 215.5 and 221.4 pounds per year. (4 pts)

c. What should be the sample size such that the probability of sample mean being greater than 226.1 is 5%. (3 pts)

Q4: The time a technician requires to perform preventive maintenance on air conditioning unit is governed by the exponential distribution with mean time one hour. The company operates 70 of these units. What is the probability that their average maintenance time exceeds 50 minutes? (3 pts)

Q5: The probability a unit produced by a machine turns out to be defective is 0.175. Among 200 units randomly selected, Approximate the probability that at most 30 will be defective. (5 pts)

Q6: An automobile insurance company selected random samples of 300 single male policyholders who had reported accidents at some time within the past 3 years. The resulting data were that 19% of the single policyholders had reported an accident.

a. Estimate the true population proportions of policyholders using 91% confidence interval. (3 pts)

b. Interpret the interval in part a above? (2 pts)

Q7: A market research firm supplies manufacturers with estimates of the retail sales of their products from samples of retail stores. Suppose that a random sample of size 25 stores this month shows mean sales of 52 units with standard deviation of 13 units. During the same month last year, a random sample of size 20 stores gave mean sales of 49 units, with standard deviation of 11 units.

a. Form a 90% confidence interval for the difference in the mean number of units sold at all retail stores. (4 pts)

b. Do you need any assumptions? If yes, what? If no, why? (2 pts)

STAT211 Final Exam Formula Sheet

Descriptive Statistics

- Sample Mean $\bar{X} = \frac{\sum X_k}{n}$ or $\frac{\sum x_i^* f_i}{\sum f_i}$
- Sample Variance $s^2 = \frac{\sum (X_i - \bar{X})^2}{n-1} = \frac{\sum x^2 - \frac{1}{n}\left(\sum x\right)^2}{n-1}$ or $\frac{\sum x_i^{*2} f_i - \left(\sum x_i^* f_i\right)^2 / n}{n-1}$
- Percentiles: $R_\alpha = \frac{\alpha}{100}(n+1) = i.d \quad P_\alpha = X_{(i)} + d\left(X_{(i+1)} - X_{(i)}\right)$

Probability

- $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- $P(A \cap B') = P(A) - P(A \cap B)$
- $P(A|B) = \frac{P(A \cap B)}{P(B)}$, $P(B) > 0$
- $P(B_j | A) = \frac{P(B_j \cap A)}{P(A)} = \frac{P(A|B_j)P(B_j)}{\sum_{i=1}^{k} P(A|B_i)P(B_i)}$ for $j = 1,2,\ldots,k$

Random Variables

- $E(X) = \sum xp(x)$ *or* $E(X) = \int xf(x)dx$
- $\sigma^2 = \sum x^2 p(x) - \mu^2$ *or* $\sigma^2 = \int x^2 f(x)dx - \mu^2$
- Statistical Distributions

  a. $P(x) = C_x^n\, p^x (1-p)^{n-x},\ \ x = 0, 1, \ldots, n,\ \ \mu = E(x) = np,\ \ \sigma = \sqrt{np(1-p)}$

  b. $P(x) = \frac{(\lambda t)^x e^{-\lambda t}}{x!},\ \ x = 0, 1, \ldots,\ \ \mu = E(x) = \lambda t,\ \ \sigma = \sqrt{\lambda t}$

  c. $P(x) = \frac{C_{n-x}^{N-X}\, C_x^X}{C_n^N} = \frac{\binom{N-A}{n-x}\binom{A}{x}}{\binom{N}{n}}$

  d. $f(x) = \lambda e^{-\lambda x},\ \ x > 0,\ \ \mu = E(x) = \frac{1}{\lambda},\ \ \sigma = \frac{1}{\lambda}$

- **Confidence Interval Estimation**

a. $\bar{x} \pm z_{\alpha/2} \dfrac{\sigma}{\sqrt{n}}$, $\qquad n = \left(\dfrac{z_{\alpha/2}\ \sigma}{e} \right)^2$

b. $\bar{x} \pm z_{\alpha/2} \dfrac{s}{\sqrt{n}}$, $\quad n = \left(\dfrac{z_{\alpha/2}\, s}{e} \right)^2$

c. $\bar{x} \pm t_{\alpha/2,f} \dfrac{s}{\sqrt{n}}$, the number of degrees of freedom $f = n - 1$

d. $\left(\overline{x_1} - \overline{x_2} \right) \pm z_{\alpha/2} \sqrt{\dfrac{\sigma_1^{\ 2}}{n_1} + \dfrac{\sigma_2^{\ 2}}{n_2}}$

e. $\left(\overline{x_1} - \overline{x_2} \right) \pm z_{\alpha/2} \sqrt{\dfrac{s_1^{\ 2}}{n_1} + \dfrac{s_2^{\ 2}}{n_2}}$

f. $\left(\bar{x}_1 - \bar{x}_2 \right) \pm t_{\frac{\alpha}{2},\, f}\ s_p \sqrt{\dfrac{1}{n_1} + \dfrac{1}{n_2}}$, $s_p^2 = \dfrac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$

g. $\left(\bar{x}_1 - \bar{x}_2 \right) \pm t_{\frac{\alpha}{2},v} \sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}$, $v = \dfrac{\left(\dfrac{s_1^{\ 2}}{n_1} + \dfrac{s_2^{\ 2}}{n_2} \right)^2}{\dfrac{\left(\dfrac{s_1^{\ 2}}{n_1} \right)^2}{n_1 - 1} + \dfrac{\left(\dfrac{s_2^{\ 2}}{n_2} \right)^2}{n_2 - 1}}$

h. $\bar{d} \pm t_{\frac{\alpha}{2},\, n-1} \dfrac{s_d}{\sqrt{n}}$

i. $p \pm z_{\alpha/2} \sqrt{\dfrac{p(1-p)}{n}}$, $n = \dfrac{z_{\alpha/2}^2\, p(1-p)}{e^2}$, $n_{\max} = \dfrac{z_{\alpha/2}^2}{4e^2}$

j. $\left(p_1 - p_2 \right) \pm z_{\alpha/2} \sqrt{\dfrac{p_1(1-p_1)}{n_1} + \dfrac{p_2(1-p_2)}{n_2}}$