Math 3339

Homework 7 (Chapters 9, 11 & 12)

Name:_____ PeopleSoft ID:_____

Instructions:

- Homework will NOT be accepted through email or in person. Homework must be submitted through CourseWare BEFORE the deadline.
- Print out this file and complete the problems or you can complete it using your computer.
- Use blue or black ink or a dark pencil if completing this by hand.
- Write your solutions in the space provided. You must show all work for full credit.
- Submit this assignment at http://www.casa.uh.edu under "Assignments" and choose **HW7**.
- Total possible points: **15.**

1. *The following data is looking at how long it takes to get to work. Let x = commuting distance (miles) and y = commuting time (minutes)

x	15	16	17	18	19	20
y	42	35	45	42	49	46

   a. Give a scatterplot of this data and comment on the direction, form and strength of this relationship.
   b. Determine the least-squares estimate equation for this data set.
   c. Give the r^2, comment on what that means.
   d. Give the residual plot based on the least-squares estimate equation.
   e. Test if this least-squares estimate equation specify a useful relationship between commuting distance and commuting time.

2. *The following another set of data that looking at how long it takes to get to work. Let x = commuting distance (miles) and y = commuting time (minutes)

x	5	10	15	20	25	50
y	16	32	44	45	63	115

   a. Give a scatterplot of this data and comment on the direction, form and strength of this relationship.
   b. Determine the least-squares estimate equation for this data set.
   c. Give the r^2, comment on what that means.
   d. Give the residual plot based on the least-squares estimate equation.
   e. Test if this least-squares estimate equation specify a useful relationship between commuting distance and commuting time.
   f. Compare this least-square estimate equation to the previous least-squares estimate equation in problem 1. In which situation would the least-squares equation be least effective? Justify your answer.

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

3. The cost of a home depends on the number of bedrooms in the house. Suppose the following data is recorded for homes in a given town

price (in thousands)	300	250	400	550	317	389	425	289	389	559
No. bedrooms	3	3	4	5	4	3	6	3	4	5

a) Make a scatterplot
b) Fit the data with a least squares regression line.
c) Give a 95% confidence interval for the slope.
d) If one house has one more number of rooms than another house, how much additional cost would we expect for the price?
e) Test the hypothesis that an extra bedroom costs $60,000 against the alternative that it costs more.

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

4. A study was conducted to examine the effect of pets in stressful situations. Fifteen subjects were randomly assigned to each of three groups to do a stressful task alone (the control group), with a good friend present, or with their dog present. The subject's mean heart rate (in beats per minutes) during the task is one measure of the effect of stress. The data has is the mean heart rates during stress with a pet (P), with a friend (F) and for the control group (C).

Control	Friend	Pet
80.369	99.692	69.169
87.446	83.4	70.169
90.015	102.154	75.985
99.046	80.277	86.446
75.477	88.015	68.862
87.231	92.492	64.169
91.754	91.354	97.538
87.785	100.877	85
77.8	101.062	72.262
62.646	81.6	58.692
84.738	89.815	79.662
84.877	98.2	69.231
73.277	76.908	69.538
84.523	86.985	70.077
70.877	97.046	65.446

This data can be obtained at https://www.math.uh.edu/~wwang/MATH3339/dataset/stress.txt.

a. Make a side by side box plot of the heart rates by the three groups. To do this in R use:
boxplot(Rate~Group,data=stress)

Does there seem to be a difference in the heart rates of the three groups? Do any of the groups show outliers or extreme skewness?

b. We want to test if there is a difference in the mean heart rates for the three groups. Give the null hypothesis of this test.
c. Does the data suggest that there is a difference among the three groups? Use $\alpha = 0.05$.
d. If there seems to be a difference, complete a Bonferroni pairwise test to determine which or if all the means are different from each other.

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

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5. A six-sided die is thrown 50 times. The numbers of occurrences of each face are shown below.

Face	1	2	3	4	5	6
Count	12	5	9	11	6	7

Can you conclude that the die is not fair?

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

6. Section 12.3.1, problem 2

Hint:
titanic.df = margin.table(Titanic,c(1,4))
titanic.df
chisq.test(titanic.df)

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.

For each of the following situations in problems 7-11, determine which of the following tests should be used. Assume necessary conditions have been met. (Answers may be used more than once or not at all.)

A. 1 sample z test B. 1 sample t test C. 2 sample t test D. Chi-squared
E. 1 proportion z test F. 2 proportion z test G. matched pairs t test

7. Consumer Reports (January 1993) stated that the mean retail cost of an AT&T model 3730 cellular phone was $600. A random sample of 10 stores in Los Angeles had a mean cost of $586.50 with standard deviation of $26.77. Does this indicate that the mean cost in Los Angeles is less than $600?

8. Athabasca Fishing Lodge is located on Lake Athabasca in northern Canada. In one of their recent brochures, the lodge advertises that 75% of their guests catch northern pike over 20 pounds. Suppose that last summer 64 out of a random sample of 83 guests did in fact catch northern pikes weighing over 20 pounds. Does this indicate that the population proportion of guests who catch pikes over 20 pounds is different from 75%?

9. A new law has been passed giving city police greater powers in apprehending suspected criminals. For six neighborhoods, the numbers of reported crimes one year before and one year after the new law are shown. Does this indicate that the number of reported crimes have dropped?

Neighborhood	1	2	3	4	5	6
Before	18	35	44	28	22	37
After	21	23	30	19	24	29

10. A machine has a record of producing 80% excellent, 16% good, and 4% unacceptable parts. After extensive repairs, a sample of 200 produced 157 excellent, 42 good, and 1 unacceptable part. Have the repairs changed the nature of the output of the machine?

11. A random sample of 378 hotel guests was taken one year ago, and it was found that 178 requested nonsmoking rooms. Recently, a random sample of 516 hotel guests showed that 320 requested nonsmoking rooms. Do these data indicate that the proportion of hotel guests requesting nonsmoking rooms has increased?

* Problems came from Devore, Jay and Berk, Kenneth, *Modern Mathematical Statistics with Applications,* Thomson Brooks/Cole, 2007.