Math 525 - Homework 5

Due Monday 04/22

Unless otherwise instructed, conduct all hypothesis tests at the $\alpha = .05$ level. Note that the chapter numbers no longer correspond to the current edition of the book; they are just there for my own purposes. The material on confidence intervals is available on the class website.

1. *Problem 12.1:* Explain the trade off between precision and confidence for interval estimates.

2. *Problem 12.6:* A school wants to know how much TV it's students watch and they assume it is normally distributed. A sample of $n = 25$ kids produce a mean $\bar{X} = 3.1$ and a standard deviation of $S = 3$. Make a 90% confidence interval for the true population mean.

3. *Problem 13.1:* Explain why the F-ratio of an ANOVA test is expected to be near 1.00 when the null hypothesis is true.

4. *Problem 13.20:* Fill in the missing values from this ANOVA summary table below and determine if you can reject H_0. This data was created by studying $n = 12$ participants in 3 different treatment conditions. *Hint: Start with the df column.*

Source	SS	*df*	MS	
Between	____	____	9	$F = ?$
Within	____	____	____	
Total	117	____		

5. *Problem 13.19:* Students are asked how likely they are to cheat on an exam on a scale of 1 to 10; the results are below. Determine with an ANOVA whether or not there is a significant difference between mean likelihood of student cheating beliefs across teacher ability.

Poor	Average	Good	
$n = 6$	$n = 8$	$n = 10$	$N = 24$
$\bar{X} = 6$	$\bar{X} = 2$	$\bar{X} = 2$	$\sum X = 72$
$SS = 30$	$SS = 33$	$SS = 42$	$\sum X^2 = 393$

6. *Problem 12.18:* The following data measures the number of doses required for three different treatments of bird flu before the patient saw improvement.

Treatment			
I	II	III	
2	5	7	$N = 14$
5	2	3	$\sum X = 42$
0	1	6	$\sum X^2 = 182$
1	2	4	
2			
2			
$\sum X_1 = 12$	$\sum X_2 = 10$	$\sum X_3 = 20$	
$SS_1 = 14$	$SS_2 = 9$	$SS_3 = 10$	

Run an ANOVA to determine if there is a significant difference in the mean dose requirement for these three treatments. If there is, run a Scheffé post-hoc test to determine which treatments are significantly different.

7. *Problem 13.4:* Why is it better to use ANOVA than multiple t-tests to determine if several normally distributed populations have equal means?

8. *Problem 16.10:* Use this data to answer the following questions. For each correlation coefficient, determine if it is statistically significant.

X	3	4	2	1	0
Y	5	3	4	1	2
Z	5	2	6	3	4

   a) Compute the Pearson coefficient between X and Y. **b)** Compute the Pearson coefficient between Y and Z. **c)** Compute the Pearson coefficient between X and Z. **d)** Try to make a general conclusion about correlations based on answering "If X is related to Y and Y is related to Z, does this require X to be related to Z?".

9. *Problem 15.10:* For the following set of scores:

X	6	3	5	6	4	6
Y	4	1	0	7	2	4

   a) Compute the Pearson correlation. **b)** Add 2 points to each X value and compute the correlation for these modified values. How does adding a constant affect the correlation? **c)** Multiply each of the original X values by 2 and compute the correlation for these modified values. How does this scaling affect the correlation?

10. *Problem 17.8:* Use the following data to answer these questions about regression.

X	1	4	3	2	5	3
Y	2	7	5	1	14	7

   a) Find the regression equation for predicting Y from X. **b)** Used the regression equation to find a predicted Y for each X. **c)** Find the difference between the observed Y values and the predicted Y values and make a column of data containing those differences. Compute the SS_{res} value of that column. **d)** Calculate the Pearson correlation coefficient r for this data. Use r^2 and SS_y to compute SS_{res} and compare it to the value from part **c**.