STAT 515 – Fall 2003 - Practice Final

Part I: Answer three of the following four questions. If you answer more than three I will grade only the first three. Five points each.

1) Define what is meant by the p-value (or observed significance level) of a test.

2) (Circle the correct answers) An automaker's new line of trucks and SUVs consists of several that get between 22 and 25 miles per gallon on the highway, and two that get 12 to 15 miles per gallon. The automaker would likely prefer that the **mean / median** fuel economy for the entire line be reported. Because the distribution is very skewed to the left, if we were given the mean and standard we would be able to say that **around 68% / at least 75% / around 95% / at least 95%** of the mileages should be within two standard deviations of the mean.

3) A biased coin (probability of a head on one flip = 0.4) is flipped 9 times. What are the mean and standard deviation of the number of heads that will be observed?

4) An achievement test is designed to have scores that are approximately normally distributed with a mean of 20 and a standard deviation of 4. What percent of scores should fall between 20 and 25?

Part II: Answer every part of the next three problems. Read each problem carefully, and show your work for full credit. Twenty points each.

1) *Forbes* (Dec. 13, 1999) reported that the consulting firm Creative Goods found that 40% of online shoppers failed in their attempts to purchase merchandise on-line because Web sites are too complex.
A second consulting firm asked a random sample of 60 on-line shoppers to test randomly selected e-commerce Web sites. Only 15 were unable to complete the purchase.

A) State the appropriate null and alternate hypothesis to test if web-site complexity is less of a deterant than Creative Goods reported it to be. (Identify any parameters that you use.)

B) Find the p-value for testing the hypothesis in part A. Report your conclusion at α=0.10 level. (e.g. Do we accept or reject H_0? Is the percentage of people deterred 40% or is it less?)

C) Construct a 95% confidence interval for the percentage of all consumers who would be deterred in their shopping attempts by web-site complexity.

D) What assumptions need to be satisfied in order to trust the results you obtained in part C?

2) Cook and Jacobsen (1978) studied the accuracy of using observers in small aircraft to estimate the size of flocks of snow geese in the Hudson Bay. The goal was to predict the actual number (measured from a photograph) from the observed number. The SAS code and output for performing the appropriate regression are found on the attached pages labeled `DATA geese.`

A) Note that four values have been deleted from the ANOVA table. What values should they have?

SS for Error	______________	MS for Error	___________
df for Error	______________	F Statistic	___________

B) If the observer counts 100 geese, how many do you estimate are actually in the flock?

C) Why should you doubt the prediction in part B?

D) On average, how far from the estimated regression line do you expect the observed values to be?

E) Two plots are given at the bottom of the output: the residual vs. predicted plot and the q-q plot. Three of the regression assumptions can be tested by looking at these graphs. Which ones are tested by which graph?

Residual vs. Predicted Plot is for checking:

Q-Q plot of the Residuals is for checking:

3) The data below is from a 2001 issue of the Journal of the American Medical Association. It concerns 1,913 patients suffering from acute myocardial infarction. Each patient was classified according to their drinking habits and type of heart failure.

	Abstain	7 or fewer	7 or more
Congestive	146	106	29
Not congestive	750	590	292

A) Would this data be analyzed by using a test of independence, a test of homogeneity, or a goodness of fit test?

B) Write out the tables of expected values for conducting this test.

C) Give the formula for X^2 for this problem (plugging the values in, but not needing to simplify).

D) What is the rejection region (critical region) for conducting this test at $\alpha=0.01$?

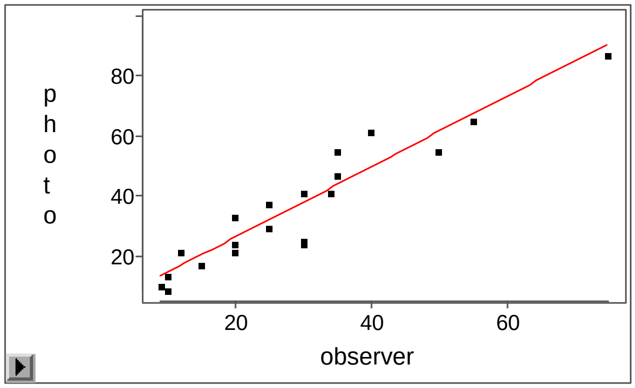
E) Why is, or why isn't, the sample size of this experiment large enough for performing this hypothesis test?

```
DATA geese;
INPUT photo observer;
CARDS;
56     50
38     25
25     30
48     35
38     25
22     20
22     12
42     34
34     20
14     10
30     25
9      10
18     15
25     20
62     40
26     30
88     75
56     35
11     9
66     55
42     30
30     25
;

PROC INSIGHT;
OPEN geese;
FIT photo=observer;
RUN;
```

Model Equation

photo	=	2.9101	+	1.1714	observer



Summary of Fit

Mean of Response	36.4545	R-Square	0.8900
Root MSE	6.7441	Adj R-Sq	0.8845

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Stat	Pr > F
Model	1	7361.7866	7361.7866		<.0001
Error					
C Total	21	8271.4545			

Parameter Estimates

Variable	DF	Estimate	Std Error	t Stat	Pr >|t|	Tolerance	Var Inflation
Intercept	1	2.9101	3.0032	0.97	0.3441	.	0
observer	1	1.1714	0.0921	12.72	<.0001	1.0000	1.0000