Q SCI 381: Introduction to Probability and Statistics
S. Scherba, Jr. Assignment #5: Review Exercises

A Special Question (*13 points*).

We have discussed statistical errors and several hypothesis tests in class. For this question, I have posted an article by Nuzzo on our Canvas website under **Files > Assignments > Assignment 5 > Paper for Review Exercises.**

Read the article: Regina Nuzzo. (2014). Statistical Errors. *Nature*. 506. 150 – 152. Based upon the course material and your reading of this article, and using brief, well written English sentences, please type you answer the following questions:

a. (*2 points*) In your own words, summarize the main thesis of the article.

b. (*2 points*) Given what we learned in class, please define the p-value and α.

c. (*2 points*) According to its originator, what was the p-value originally meant to be used for? How did he mean for it to be used?

d. (*3 points*) The author mentions that statisticians suggest incorporating several other measures or additions into a good statistical analysis to "… avoid the trap of thinking about results as significant or not significant…." Identify three (3) of those other measures or additions and mention the value they would add to a statistical analysis.

e. (*3 points*) What three (3) questions are mentioned as questions that a scientist should ask after a scientific study?

f. (*1 point*) Given what you have learned in class and read in the article, please comment on the following statement: "The use of modern statistical software packages for analyzing data from scientific research means that even researchers with no statistical knowledge can today perform meaningful valid analyses of data with great ease."

Short answers (*22 points*).

1. (*1 point*) Hypotheses are always stated in terms of either [a] sample statistics, or [b] population parameters? Why?
2. (*5 points*) List the 5 steps of hypothesis testing.
3. (*8 points*) Complete the following table and define all symbols. Be sure to define and identify Type I and Type II errors.

	OUR DECISION	
TRUE STATE OF NATURE	**If H_0 is Not Rejected**	**If H_0 is Rejected**
H_0 is true		
H_0 is false		

4. (8 *points*) Using the 5 steps of hypothesis testing answer the following. For ease of reading, please do this step-by- step. Draw a well labeled picture clearly identifying the critical values and the rejection region:

   You collect data on the lengths of the tails of African Pygmy squirrels (*Myosciurus pumilio*), the smallest squirrel species in the world. The mean length from a sample of 17 squirrels is 6.3 cm with a sample standard deviation of 0.4 cm. Can you conclude that the population mean tail length differs from 6.5 cm? Assume that the population is approximately normally distributed. Let $\alpha = 0.01$.

Problems from the text. You should not fail to do these, but they are <u>NOT TO BE TURNED IN FOR GRADING</u>. My solutions will be posted.

In F&P: 12.1, 12.2, 12.11, 12.15, and 12.36.