HW 9 is due on Friday, Oct. 25. Quiz 7 covers HW 8. **Two pages: A)- I)**

A) The diameter of a spindle in a small motor is supposed to be 5 millimeters. If the spindle is either too small or too large, the motor will not work correctly. The manufacturer measures the diameter in a sample of motors to determine whether the mean diameter has moved away from the target. i) What are the null and alternative hypotheses? ii) Explain briefly the distinction between the mean μ in your hypotheses and the mean $\overline{x}$ of the spindles the manufacturer measures.

comment: Ho is always of the form "parameter = value." To find form of Ha, find which direction is important. If both directions are important, use "not equal".

B) In a SRS of 16 automobile engine crankshafts, $\overline{x} = 224.002$. The crankshafts are known to be normal with $\sigma = 0.060$. The process mean is supposed to be 224. Carry out a 4 step test to determine if the data give evidence that the mean is not equal to 224.

comment: A test is significant at the 5% level if the pvalue is less than .05. See p. 376. See p. 378 and ex. 14.9 for calculating the test statistic and the pvalue. Also see ex. 14.10.

C) Suppose SATM (math) scores are normal with mean $\mu = 475$ and sd $\sigma = 100$. One hundred students go through a training program designed to raise their SATM scores. Carry out a 4 step test for Ho: $\mu = 475$ versus Ha: $\mu > 475$ for each of the following situations.

a) The students' average score is $\overline{x} = 491.4$.

b) The students' average score is $\overline{x} = 491.5$.

comment: Carry out a 4 step test for a) and b). A test is significant at the 5% level if the pvalue is less than .05. The point is that the difference between 491.4 and 491.5 is not important, but the tests give different conclusions at the .05 level. See p. 376. See p. 378 and ex 14.9 for calculating the test statistic and the pvalue. DO NOT FORGET TO GIVE A NONTECHNICAL CONCLUSION.

D) 15.10a A researcher looking for evidence of ESP (extrasensory perception) tests 500 subjects. Four subjects have pvalue < 0.01. Is it proper to conclude that these subjects have ESP? Explain briefly.

comment: See p. 403. Here alpha = delta = 0.01 instead of 0.05.

E) 15.17a Suppose a medical program scans the results of routine medical tests (pulse rate, blood tests, etc.) and either clears the case or refers the case to a doctor. The program is used to screen thousands of people who do not have specific medical complaints. The program makes a decision for each person.

What are the two hypotheses and the two types of error that the program can make? Describe the two types of error in terms of "false positive" and "false negative" test results.

comment: Let Ho: person should see doctor and Ha: person should not see doctor. (This switches the hypotheses in the solutions in the back of the text.) See p. 410. A "false positive" occurs when the patient is told to see the doctor when the visit is not necessary.

F) A medical study finds that $\overline{x} = 114.9$ and $s = 9.3$ for the seated systolic blood pressure of the 27 members of one treatment group. What is the standard error of the mean?

comment: See p. 444.

G) Use Table C to find

a) the value with probability 0.05 to the right under the $t(5)$ density curve.

b) The value with probability 0.99 to the left under the $t(21)$ density curve.

comment: Table C gives area to the right, and part b) says the area to the left is 0.99. Subtract this from the total area under the curve to get the area to the right.

H) Assume that the measurements below on specimens of amber from the late Cretaceous era (75 to 95 million years ago) are a SRS. The measurements are percents of nitrogen in the air. Find a 95% t confidence interval for the mean percent of nitrogen in ancient air.

63.4 65.0 64.4 63.3 54.8 64.5 60.8 49.1 51.0

comment: Use p. 40 and p. 49 to compute the sample mean and S. Then use p. 447 to get the t confidence interval.

I) 17.10 The data in H) suggest that the mean percent of nitrogen in the air during the Cretaceous era is quite different from the present 78.1 (percent). Carry out a 4 step test.

comment: Use values calculated in H). See p. 450 and ex. 17.3 for the 4 step test. DO NOT FORGET TO GIVE A NONTECHNICAL CONCLUSION.