Additonal Testing/Confidence Interval Problems

1. The National Center for Health Statistics reports that the mean systolic blood pressure for males 35 to 44 years of age is 128 and the standard deviation in this population is 15. The medical director of a large company looks at the medical records of 72 executives in this age group and finds that the mean systolic blood pressure in this sample is 126.07. Is this evidence that the company's executives have a different mean blood pressure from the general population?

2. In a discussion of the educational level of the American workforce, someone says, "The average young person can't even balance a checkbook." The National Assessment of Educational Progress (NAEP) says that a score of 275 or higher on its quantitative test reflects the skill needed to balance a checkbook. The NAEP random sample of 840 young men had a mean score of 272, a bit below the check-book balancing level, and a standard deviation of 60. Is this sample result good evidence that the mean for all young men is less than 275?

3. Here are measurements (in millimeters) of a critical dimension on a sample of automobile engine crankshafts.

224.120	224.001	224.017	223.982
223.960	224.089	223.987	223.976
224.098	224.057	223.913	223.999
223.989	223.902	223.961	223.980

The manufacturing process is known to vary normally. The process mean is supposed to be 224 mm. Do these data give evidence that the process mean is not equal to the target value 224 mm?

4. To determine whether the mean nicotine content of a brand of cigarettes is greater than the advertised value of 1.4 milligrams, a health advocacy group tests

$$H_0 : \mu = 1.4 \; H_a : \mu > 1.4$$

The calculated value of the test statistic is z = 2.42.

   (a) Is this result statistically significant at the 5% level?

   (b) Is this result highly significant at the 1% level?

5. Experiments on learning in animals sometimes measure how long it takes mice to find their way through a maze. The mean time is 18 seconds for one particular maze. A researcher thinks that a loud noise will cause the mice to complete the maze faster. She measures how long each of 10 mice takes with a noise as stimulus. What is the null hypothesis and alternative hypothesis? What test statistic would you use here? What is necessary to carry out this test? To reject the null hypothesis at the 5% level, how small will the test statistic have to be?

6. Many homeowners buy detectors to check for the invisible gas radon in their homes. How accurate are these detectors? To answer this question, university researchers placed 12 radon detectors in a chamber that exposed them to 105 picocuries per liter of radon. The detector readings were as follows:

91.9	97.8	111.4	122.3	105.4	95.0
103.8	99.6	96.6	119.3	104.8	101.7

(a) Is there convincing evidence that the mean reading of all detectors of this type differ from the true value 105?

(b) How would you do a 95% confidence interval for the mean reading of all detectors of this type?

7. The one-sample t statistic for a test of

$$H_0 : \mu = 10 \; H_a : \mu < 10$$

based on n = 10 observations has the value $t = -2.25$.

(a) What are the degrees of freedom for this test statistic?

(b) Between what two probabilities from the table does the P-value of the test fall?

8. True/False:

   (a) It is a good idea to look at your data to help you decide which hypothesis to test with it.

   (b) As the P-value gets smaller, evidence against the null hypothesis gets stronger.

   (c) In hypothesis testing if the P-value is 1 percent, there is a 1 percent chance that the null hypothesis being tested is true.

9. Consider the following hypotheses

$$H_0 : \mu = 0 \; H_a : \mu > 0$$

   What if the sample average is equal to -1.0. Do you have enough information to make a decision? The P-value for this test must be at least what %?

10. An article in the March 16, 1993, Washington Post stated that nearly 45% of all Americans have brown eyes. A random sample of 80 people found 32 with brown eyes. Is there sufficient evidence at the .01 level to indicate that the proportion of brown-eyed people in the region where the study was performed differs from the value reported in the Washington Post?

11. What is the difference between a one-tailed test and a two-tailed test?