Homework 7.

(Due Nov. 3)

8.1.12 A sample of 19 data observations has a sample mean of $\bar{x} = 11.80$. If an experimenter wishes to use a "known" value of $\sigma = 2.0$ for the population standard deviation, find the value of c for which $\mu \in (c, \infty)$ is a one-sided 95% confidence interval for the population mean μ.

8.1.16 The pH levels of a random sample of 16 chemical mixtures from a process were measured, and a sample mean $\bar{x} = 6.861$ and a sample standard deviation $s = 0.440$ were obtained. The scientists presented a confidence interval (6.668, 7.054) for the average pH level of chemical mixtures from the process. What is the confidence level of this confidence interval?

8.2.4 (Significant level = 0.05) A random sample of 25 components is obtained, and their weights are measured. The sample mean is 71.97 g and the sample standard deviation is 7.44 g. Conduct a hypothesis test to assess whether there is sufficient evidence to establish that the components have an average weight larger than 70 g.

8.2.10 An experimenter is interested in the hypothesis testing problem

$$H_0 : \mu \geq 420.0 \quad \text{versus } H_A : \mu < 420.0$$

where μ is the average radiation level in a research laboratory. Suppose that a sample of $n = 29$ radiation level measurements is obtained and that the experimenter wishes to use a value of $\sigma = 10.0$ for the standard deviation of the radiation levels.

(a) For what values of the z-statistic does the experimenter *accept* the null hypothesis with a size $\alpha = 0.10$?

(b) For what values of the z-statistic does the experimenter *reject* the null hypothesis with a size $\alpha = 0.01$?

Suppose that the sample mean is $\bar{x} = 415.7$.

(a) Is the null hypothesis accepted or rejected with $\alpha = 0.10$? With $\alpha = 0.01$?

(b) Calculate the exact p-value.

8.2.18 (Significant level = 0.05) **Paving Slab Weights**
Consider the data set of paving slab weights given in DS 6.1.7. The slabs are supposed to have an average weight of 1.1 Kg. Is there any evidence that the manufacturing process needs adjusting?

8.2.28 An experimenter is interested in the hypothesis testing problem

$$H_0 : \mu = 430.0 \quad \text{versus } H_A : \mu \neq 430.0$$

where μ is the average breaking strength of a bundle of wool fibers. Suppose that a sample of $n = 20$ wool fiber bundles is obtained and their breaking strengths are measured.

(a) For what values of the t-statistic does the experimenter *accept* the null hypothesis with a size $\alpha = 0.10$?

(b) For what values of the t-statistic does the experimenter *reject* the null hypothesis with a size $\alpha = 0.01$?

Suppose that the sample mean is $\bar{x} = 436.5$ and the sample standard deviation is $s = 11.90$.

(a) Is the null hypothesis accepted or rejected with $\alpha = 0.10$? With $\alpha = 0.01$?

(b) Write down an expression for the p-value and evaluate it using a computer package.

8.2.34 A sample of $n = 39$ observations has a sample mean of $\bar{x} = 5532$ and a sample standard deviation of $s = 287.8$. Consider the hypothesis testing problems:

(a) $H_0 : \mu = 5680$ versus $H_A : \mu \neq 5680$

(b) $H_0 : \mu \leq 5450$ versus $H_A : \mu > 5450$

In each case, write down an expression for the p-value. What do the critical points in Table III tell you about the p-values? Use a computer package to evaluate the p-value exactly.

8.6.5 **Osteoporosis Patient Heights**
Consider the data set of osteoporosis patient heights given in DS 6.6.4. Use a computer package to construct 90%, 95%, and 99% two-sided t-intervals for the mean height. Is 70 inches a plausible value for the mean height?

8.6.18 In a sample of size 33 a sample mean of 382.97 and a sample standard deviation of 3.81 are obtained.

(a) Use an appropriate hypothesis test to assess whether there is sufficient evidence to establish that the population mean is different from 385.

(b) Construct a 99% two-sided confidence interval for the population mean.

8.6.48 A company is planning a large telephone survey and is interested in assessing how long it will take. In a short pilot study, 40 people are contacted by telephone and are asked the specified set of questions. The times of these 40 telephone surveys have a sample mean of $\bar{x} = 9.39$ minutes, with a sample standard deviation of $s = 1.041$ minutes.

(a) Can the company safely conclude that the telephone surveys will last on average no more than 10 minutes each?

(b) Construct a 99% one-sided t-interval that provides an upper bound on the average time of each telephone call.