Remember, P-values can be easily found using computer software or a TI-83/84 Plus calculator. Also, this difficulty in finding P-values can be avoided by using the critical value method of testing hypotheses instead of the P-value method.

Confidence Interval Method

We can use a confidence interval for testing a claim about μ. For a two-tailed hypothesis test with a 0.05 significance level, we construct a 95% confidence interval, but for a one-tailed hypothesis test with a 0.05 significance level, we construct a 90% confidence interval (as described in Table 8-1 in Section 8-2).

In Section 8-3 we saw that when testing a claim about a population *proportion*, the critical value method and P-value method are equivalent, but the confidence interval method is somewhat different. When testing a claim about a population mean, there is no such difference, and all three methods are equivalent.

Example 4 Confidence Interval Method

Use the sample data from Example 1 to construct a confidence interval that can be used to test the claim that $\mu < 1.00$ W/kg, assuming a 0.05 significance level.

Solution

Requirement check The requirements have already been verified in Example 1. ✓

We note that a left-tailed hypothesis test conducted with a 0.05 significance level corresponds to a confidence interval with a 90% confidence level. (See Table 8-1 in Section 8-2.) Using the methods described in Section 7-4, we construct this 90% confidence interval estimate of the population mean:

$$0.707 \text{ W/kg} < \mu < 1.169 \text{ W/kg}$$

Because the assumed value of $\mu = 1.00$ W/kg is contained within the confidence interval, we cannot reject the null hypothesis that $\mu = 1.00$ W/kg. Based on the 11 sample values given in Example 1, we do not have sufficient evidence to support the claim that the mean radiation level is less than 1.00 W/kg.

Example 5 Fatal Overloading

When a plane crashed in Charlotte, North Carolina, 21 passengers were killed. In Lake George, New York, 20 passengers died when the *Ethan Allen* tour boat capsized. In Baltimore's Inner Harbor, 5 passengers died when a water taxi sank. In all of these fatal incidents, overloading was thought to be a contributing factor. Loading capacities were based on old estimates of the mean weight of men, but that mean has increased in recent years with the effect that some boats and airplanes have been overloaded and unsafe. Using the weights of the simple random sample of men from Data Set 1 in Appendix B, we obtain these sample statistics: $n = 40$, $\bar{x} = 182.9$ lb, and $s = 40.8$ lb. (The original weights are in kilograms, and they are converted to pounds before computing these statistics.) Use these results to test the claim that men have a mean weight greater than 166.3 lb, which was the weight in the National Transportation and Safety Board's recommendation M-04-04. Use a 0.05 significance level.

Solution

Requirement check (1) The sample is a simple random sample. (2) Because the sample size of $n = 40$ is greater than 30, we satisfy the requirement