

Homework 10

Due Tuesday, April 23

1. The output voltage for an electric circuit is specified to be 130. A sample of 40 independent readings on the voltage for this circuit gave a sample mean 128.6 and standard deviation 2.1. Test the hypothesis that the average output voltage is 130 against the alternative that it is less than 130. Use a test with level $\alpha = 0.01$.
2. A random sample of 500 measurements on the length of stay in hospitals had sample mean 5.4 days and sample variance 9.61 days. A federal regulatory agency hypothesizes that the average length of stay is in excess of 5 days. Test the hypothesis that the length of stay is 5 days (or less) versus the alternative that it is in excess of 5 days, at $\alpha = 0.05$.
3. Company records show that drivers get an average of 32,500 miles on a set of Road Hugger All-Weather radial tires. Hoping to improve that figure, the company has added a new polymer to the rubber that should help protect the tires from deterioration caused by extreme temperatures. Fifteen drivers who tested the new tires have reported getting an average of 33,800 miles. Can the company claim that the polymer has produced a statistically significant increase in tire mileage? Test $H_0 : \mu = 32,500$ against a one-sided alternative at the $\alpha = 0.05$ level. Assume that the standard deviation of the tire mileages has not been affected by the addition of the polymer and is still 4000 miles.

4. Suppose that we are given the following measurements:

12.3 12.7 12.6 13.1 13.2 12.8 13.1 12.9 13.1 12.4
 13.6 12.7 12.6 13.1 12.4 12.6 13.3 12.6 12.4 13.1
 12.9 12.6 12.7 12.5 12.4 12.4 12.6 12.7 12.4 12.9

Assume that $\sigma = 0.4$ Test the hypothesis that the mean measurement is at 12.6 against the hypothesis that is not 12.6. Test using $\alpha = 0.05$.

5. Consider comparing traditional and activity-oriented methods for teaching biology. Pretests were given to students who were subsequently taught by one of the two methods. Summary statistics were given for the pretest scores for 368 students who were subsequently taught using the traditional method and 372 who were taught using the activity-oriented method. The mean and standard deviation of the pretest scores for those subsequently taught using the traditional method were 14.06 and 5.45, respectively. For those subsequently taught using the activity-oriented method, the respective corresponding mean and standard deviation were 13.38 and 5.59. Do the data provide support for the conjecture that the mean pretest scores do not differ for students subsequently taught using the two methods? Test using $\alpha = 0.01$.
6. According to the Washington Post, nearly 45% of all Americans are born with brown eyes, although their eyes don't necessarily stay brown. A random sample of 80 adults found 32 with brown eyes. Is there sufficient evidence at the 0.01 level to indicate that the proportion of brown-eyed adults differs from the proportion of Americans who are born with brown eyes?

7. A manufacturer of automatic washers offers a model in one of three colors: A, B, or C. Of the first 1000 washers sold, 400 were of color A. Would you conclude that customers have a preference for color A? Justify your answer, at $\alpha = 0.01$.
8. In March 2001, a Gallup poll asked, “How would you rate the overall quality of the environment in this country today—as excellent, good, fair or poor?” Of 1060 adults nationwide, 46% gave a rating of excellent or good. Is this convincing evidence that a majority of the nation’s adults think the quality of the environment is fair or poor? Test using $\alpha = 0.05$.
9. A sample of 40 independent readings on the voltage for this circuit gave a sample mean 128.6 and standard deviation 2.1. Find a 95% confidence interval for the average voltage.
10. One suggested method for solving the electric-power shortage in a region involves constructing floating nuclear power plants a few miles offshore in the ocean. Concern about the possibility of a ship collision with the floating (but anchored) plant has raised the need for an estimate of the density of ship traffic in the area. The number of ships passing within 10 miles of the proposed power-plant location per day, recorded for $n = 60$ days during July and August, possessed a sample mean and variance of 7.2 and 8.8, respectively. Find a 95% confidence interval for the mean number of ships passing within 10 miles of the proposed power-plant location during a 1-day time period.