

Homework 7

Due Tuesday, October 28

1. 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 $\alpha = 0.05$.
2. 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 data comes from a normal distribution with the standard deviation of 4000 miles.
3. Please find the dataset `town.250.txt`, which contains the heights (in cm) of 250 residents in a town. The entire country as a whole is believed to have an average height of 170 cm with the standard deviation of 15 cm. But the mayor of the town wonders if the average height has gone up and is now more than 170 cm. Test this claim, at the level $\alpha = 0.1$.
4. Please find the dataset `hw5.12.csv` (from HW 5). Let us assume (for now) that the data comes from iid $N(13.5, 25)$. From the results in HW 5, we found that the sample mean exceeds 13.5. Test the hypothesis that the population mean exceeds 13.5, at the $\alpha = 0.05$ level.
5. From a sample of 100 students, 62 of them agree that the dorm food is good. The administration would like to believe that over 60% of the students will agree that the dorm food is good. Does the result support the administration's claim? Test using $\alpha = 0.01$.
6. 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 $\alpha = 0.05$.
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 (over both colors B and C)? Test at the level $\alpha = 0.01$.
8. A scientist is interested in comparing two methods of pest control. One method consists of treating the area with chemicals, and another method consists of treatment that is naturally derived. The scientist applies treatment to 72 areas, 36 for each treatment. The mean number of pests eliminated by chemical treatment is 5.13, while the mean number of pests eliminated by natural treatment is 3.99, with the variances assumed to be 63.96 and 67.39, respectively. Test the claim that chemical treatment eliminates more pests, at the level $\alpha = 0.3$.

9. Suppose that women and men are measured for total cholesterol (mg/dL) at a clinic. It is found that 48 women have average of 271 mg/dL total cholesterol, while 44 men have average of 253.3 mg/dL total cholesterol. The standard deviation for both group is assume to be 44.1 mg/dL. Test for the hypothesis that women have higher total cholesterol than men, at the level $\alpha = 0.0001$.
10. Please find the dataset `two.sample.g.txt`, with the columns Y1 and Y2 representing two groups. We are interested in testing for the alternative that the mean of Y1 is higher than that of Y2. Assuming that $\sigma_1 = 12$ and $\sigma_2 = 15$, perform this test at the level $\alpha = 0.004$.
11. A study examines racial differences in the incidence of disease by examining records for infants born at a hospital. It is found that 43 out of 3584 black and 17 out of 3831 white infants have the disease. Test the hypothesis that black infants have higher incidence of disease than white infants, at the level $\alpha = 0.05$.
12. The following table gives information on the occurrence of sudden infant death syndrome (SIDS), from mothers who were 19 or under versus mothers who were over 19 years of age.

Age	SIDS		None
≤ 19	76	164	
> 19	217	1151	

Using this information, is there enough evidence to support that mothers who are 19 or under have more SIDS occurrence than those who are over 19? Test at the level $\alpha = 0.02$.