

HW #8

(1) A tire company claims that the average mileage of a certain brand of tires can last is 29,200 miles. A sample of $n = 22$ tires is taken at random to assess their mileage, resulting in the sample mean $\bar{x} = 29,132$ and sample variance $s^2 = 2,236$. Assuming that the distribution is normal:

(a) test the hypothesis that the true average mileage of the tires is different from 29,200 miles. Choose confidence level $\alpha = 0.01$.

(b) find a 99 percent confidence interval for μ .

(2) Lightbulbs of a certain type are advertised as having an average lifetime of 750 hours. A random sample of 50 bulbs was selected, the lifetime of each bulb determined finding that the sample average lifetime is 738.5 with sample standard deviation 38.2. Test the hypothesis that the true average lifetime is smaller than what is advertised using significance level $\alpha = 0.05$ and $\alpha = 0.01$.

(3) A rubber compound were tested for tensile strength and the following values were found

32, 30, 31, 33, 32, 30, 29, 34, 32, 31

(a) Apply the Shapiro-Wilk test to verify that the data can be modeled according to a normal distribution.

(b) Assuming that the population is normally distributed, test the hypothesis that the average tensile strength is different from 31. Use $\alpha = 0.05$. Calculate the p -value of the test.

(4) Using the same data as in Problem 4 and still assuming that the population is normally distributed, test the hypothesis that the average tensile strength is larger than 31. Use $\alpha = 0.05$. Calculate the p -value of the test.

(5) Two rubber compounds were tested for tensile strength and the following values were found

A : 32, 30, 33, 32, 29, 34, 32

B : 33, 35, 36, 37, 35, 34

Under the assumption that the two populations are normally distributed, test the hypothesis that the average tensile strength of the two rubber compounds is different using significance level $\alpha = 0.01$ and $\alpha = 0.05$.

(6) In comparing the times until failure (in hours) of two different types of light bulbs, we obtain the sample characteristics $n_1 = 45$, $\bar{x} = 984$, $s_x^2 = 8,742$ and $n_2 = 52$, $\bar{y} = 1,121$, $s_x^2 = 9,411$. Test the hypothesis that the average duration of the second type of light bulbs is higher than the first type. at significance level $\alpha = 0.05$.

(7) A sample of 12 radon detectors of a certain type was selected, and each was exposed to 100 pCi/L of radon. The resulting readings were as follows:

105.6, 90.9, 91.2, 96.9, 96.5, 91.3, 100.1, 105.0, 99.6, 107.7, 103.3, 92.4

(a) Apply the Shapiro-Wilk test to verify that data can be modeled using the Normal distribution.

(b) Does this data suggest that the population mean reading under these conditions differs from 100? State and test the appropriate hypotheses using significance level $\alpha = 0.05$.

(c) Suppose that prior to the experiment a value of $\sigma = 7.5$ had been assumed. How many determinations would then have been appropriate to obtain $\beta = 0.10$ for the alternative hypothesis $\mu_1 = 95$?

(8) Subjects in a study included a sample of 37 male soccer players whose mean body mass index (BMI) was 25.21 with a standard error of 1.67 and a sample of 24 male rugby players whose mean BMI was 27.15 with a standard error of 2.64. Is there sufficient evidence for one to claim that, in general, rugby players have a different BMI than soccer players? Let $\alpha = 0.01$. You can assume that data are normal and that the true variances of the populations are the about same.

(9) A study found that among 2430 boys ages 7 to 12 years, 450 were overweight or obese. On the basis of this study, can we conclude that more than 15 percent of the boys ages 7 to 12 in the sampled population are obese or overweight? Let $\alpha = 0.01$.

(10) A study is conducted to evaluate the analgesic effectiveness of a daily dose of oral methadone in patients with chronic neuropathic pain. The researchers used a scale $[0,100]$ with higher number indicating higher pain. Each subject took either 20 mg of methadone or placebo each day for 5 days, without knowing which treatment they were taking. The following table gives the mean maximum pain intensity scores for the 5 days for each subject. Do these data provide sufficient evidence to indicate that the maximum pain intensity is lower on days when methadone is taken? Let $\alpha = 0.05$.

Subject	Methadone	Placebo
1	29.8	57.2
2	73.0	69.8
3	98.6	98.2
4	58.8	62.4
5	60.6	67.2
6	57.2	70.6
7	57.2	67.8
8	89.2	95.6
9	97.0	98.4
10	49.8	63.2
11	37.0	63.6