

HW #10

(1) 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 $\alpha = 0.05$.

(2) 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 $\alpha = 0.05$.

(3) 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

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

(4) Subjects in a study included a sample of 37 male soccer players whose mean body mass index (BMI) was 25.21 with a sample standard deviation of 1.67 and a sample of 24 male rugby players whose mean BMI was 27.15 with a sample standard deviation of 2.64. Under the assumptions that the populations are normally distributed, is there sufficient evidence for one to claim that, in general, rugby players have a different BMI than soccer players? Let $\alpha = 0.01$.

(5) 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 $\alpha = 0.01$.

(6) 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 |

(7) Compute the linear regression model of Sales vs Spend using the dataset "hw10-data.csv" available at the homework page.

Note that the predictor (or independent) variable for our linear regression will be Spend and the dependent variable (the one we're trying to predict) will be Sales. Also compute the coefficient of determination.

Hint: to load the data from the csv file, use the R command:

```
dataset = read.csv("hw10-data.csv", header=T, colClasses = c("numeric",  
"numeric", "numeric"))
```