MTH 372: Assignment II

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Instructions

- Use statistical software R for your codes.
- Due date is April 19, 2019 (6 p.m.). No late assignments will be accepted.
- Submit all of your work which include the codes, results and graphs.
- Follow the labelling method for your files.
- If not mentioned, then use $\alpha = 0.05$.

1. (2 points) The mean response time of a species of pigs to a stimulus is .8 seconds. Twenty- eight pigs were given 2 oz of alcohol and then tested. If their average response time was 1.0 seconds with a standard deviation of .3 seconds, can we conclude that alcohol affects the mean response time? Use the 5 percent level of significance.

2. (2 points) A producer specifies that the mean lifetime of a certain type of battery is at least 240 hours. A sample of 18 such batteries yielded the following data.

   $237, 242, 232, 242, 248, 230, 244, 243, 254, 262, 234, 220, 225, 236, 232, 218, 228, 240.$

   Assuming that the life of the batteries is approximately normally distributed, do the data indicate that the specifications are not being met?

3. (2 points) A pharmaceutical house produces a certain drug item whose weight has a standard deviation of 0.5 milligrams. The company's research team has proposed a new method of producing the drug. However, this entails some costs and will be adopted only if there is strong evidence that the standard deviation of the weight of the items will drop to below 0.4 milligrams. If a sample of 10 items is produced and has the following weights, should the new method be adopted?

   $5.728, 5.731, 5.722, 5.719, 5.727, 5.724, 5.718, 5.726, 5.723, 5.722$

4. (2 points) Twenty-five men between the ages of 25 and 30, who were participating in a well- known heart study carried out in Framingham, Massachusetts, were randomly selected. Of these, 11 were smokers and 14 were not. The following data refer to readings of their systolic blood pressure.

Smokers : $124, 134, 136, 125, 133, 127, 135, 131, 133, 125, 118$.

Nonsmokers : $130, 122, 128, 129, 118, 122, 116, 127, 135, 120, 122, 120, 115, 123$.

Use this data to test the hypothesis that the mean blood pressures of smokers and nonsmokers are the same.

5. (5 points) A purification process for a chemical involves passing it, in solution, through a resin on which impurities are adsorbed. A chemical engineer wishing to test the efficiency of 3 different resins took a chemical solution and broke it into 15 batches. She tested each resin 5 times and then measured the concentration of impurities after passing through the resins. Her data were as follows: Concentration of Impurities

   Resin I: $0.046, 0.025, 0.014, 0.017, 0.043$.

   Resin II: $0.038, 0.035, 0.031, 0.022, 0.012$.

   Resin III: $0.031, 0.042, 0.020, 0.018, 0.039$.

   Test the hypothesis that there is no difference in the efficiency of the resins.

6. (2 points) An experiment was initiated to study the effect of a newly developed gasoline detergent on automobile mileage. The following data, representing mileage per gallon before and after the detergent was added for each of eight cars, resulted.

   Car without Additive : $24.2, 30.4, 32.7, 19.8, 25.0, 24.9, 22.2, 21.5$

   Mileage with Additive: $23.5, 29.6, 32.3, 17.6, 25.3, 25.4, 20.6, 20.7$

   Test the hypothesis that mileage is not affected by the additive when

   (a) the sign test is used.

   (b) the Wilcoxon signed test is used.