COSC 6323 – Statistical Methods in Research

Homework 2

February 7, 2020

Problems

1. A manufacturer of watches has established that on the average his watches do not gain or lose. He also would like to claim that at least 95% of the watches are accurate to ± 0.2 s per week. A random sample of 15 watches provided the following gains (+) or losses (-) in seconds in one week in File **Q1.csv**.

   Can the claim be made with a 5% chance of being wrong? (Assume that the inaccuracies of these watches are normally distributed.)

2. A new method of teaching children to read promises more consistent improvement in reading ability across students. The new method is implemented in one randomly chosen class, while another class is randomly chosen to represent the standard method. Improvement in reading ability using a standardized test is given for the students in each class in **Teaching.txt**. Use appropriate test to see whether the claim can be substantiated.

3. Researchers at Wolfson Children's Hospital, Jacksonville, FL tested new technology meant to reduce the number of attempts needed to draw blood from children. They collected data on the number of successes on the first attempt using the new technology and on a historical comparison group using standard technology. This data is summarized here:

	Standard Technology	*New Technology*
Successful on 1st	74	73
Unsuccessful on 1st	76	18
Total	150	91

   (a) Is there evidence that the new technology changes the probability of a success on the first attempt? Is the change for the better or for the worse?
   (b) The researchers also recorded the ages of the children. In the standard technology group, the 150 children had mean age of 5.73 and standard deviation of 6.15. In the new technology group, the mean age was 9.02 with a standard deviation of 6.10. Does the mean age of the children in the two groups differ significantly?
   (c) How do the results of part (b) complicate the interpretation of part (a) ?

4. Eight samples of effluent from a pulp mill were each divided into 10 batches. From each sample, 5 randomly selected batches were subjected to a treatment process intended to remove toxic substances. Five fish of the same species were placed in each batch, and the mean number surviving in the 5 treated and untreated portions of each effluent sample after 5 days were recorded and are given in Table A. Test to see whether the treatment increased the mean number of surviving fish.

Table A:

Mean Number Surviving								
Sample No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Untreated	5	1	1.8	1	3.6	5	2.6	1
Treated	5	5	1.2	4.8	5	5	4.4	2

5. A certain soft drink bottler claims that less than 10% of its customers drink another brand of soft drink on a regular basis. A random sample of 100 customers yielded 18 who did in fact drink another brand of soft drink on a regular basis. Do these sample results support the bottler's claim? (Use a level of significance of 0.05)

Submission

- Zip your submission folder (contains code, documents, and plots) and submit to blackboard. Name your zip file "**`FirstName_LastName_HW2.zip`**". One submission per individual.
- The homework should be submitted on BlackBoard by **3 pm on February 21**, **2020**.
- The homework report should be a pdf generated in Latex with figures from R only. All the figures and plots should have appropriate labels, titles and annotations.
- The code should also be provided.

Grading

Total points **25 pts** (5 pts each)