

ASTR 600 Homework #2: Nonparametric Statistics (Chapter 5)

1. A teacher has a class of 15 students. At the end of the semester, the grades of the students are as follows:

76, 88, 72, 71, 95, 82, 63, 90, 86, 83, 79, 77, 65, 84, 91

Test the hypothesis that these grades come from a normal distribution with a mean of 80 and a variance of 20. Use an $\alpha = .05$.

2. A new drug designed to treat asthma is being tested. Two different methodologies are designed to test the drug.
 - a. In the first method, 15 asthma sufferers are divided randomly into two groups. One group is given the new drug, the other group is given a placebo. The participants are then asked to count the number of asthma attacks over a period of time. The results are below:

Patient Number	Number of Asthma Attacks	Drug or Placebo?
A-1	3	Drug
A-2	3	Drug
A-3	2	Placebo
A-4	1	Placebo
A-5	5	Drug
A-6	6	Placebo
A-7	2	Drug
A-8	3	Drug
A-9	2	Placebo
A-10	4	Placebo
A-11	7	Placebo
A-12	3	Drug
A-13	3	Drug
A-14	6	Placebo
A-15	8	Drug

Based on this methodology, is the drug more effective than the placebo? To what significance?

- b. In another test, twelve asthma sufferers are given the new drug for one month, then a placebo for a second month.

Patient Number	Number of Asthma Attacks with Drug	Number of Asthma Attacks with Placebo
B-1	2	3
B-2	9	8
B-3	4	7
B-4	5	6
B-5	3	3
B-6	2	5
B-7	4	3
B-8	4	6
B-9	5	6
B-10	6	5
B-11	8	10
B-12	1	5

Based on this methodology, is the drug more effective than the placebo? To what significance, if any?

3. A weatherman at a local TV station has the following results:

	It Rained	It Didn't Rain
Weatherman Predicted Rain	9	6
Weatherman Predicted No Rain	7	14

What can we conclude about the accuracy of the weatherman?

4. AP tests are offered to all students in high school, regardless of grade level. Students are graded on a scale of 1 to 5. Using the following data, test if there is any correlation between grade level and score on the AP test.

Grade Level	9	11	10	11	10	9	10	12	12	11	10	9	11	12
Score on AP test	3	4	5	1	5	3	4	3	3	4	2	5	4	5

5. From the website http://astrostatistics.psu.edu/datasets/Shapley_galaxy.dat, import the dataset into R.
- Create a graph of the empirical distribution function of the velocity. Include appropriate labels on your graph.
 - Using a MWW test, test if the magnitudes and velocities come from the same underlying distribution. Justify your answer.
 - Create a boxplot of the magnitudes.
 - Create a scatterplot of right ascension versus declination, and use magnitude as a color variable in your points.