STAT 518 – HW 5 – Fall 2017

1) The following data give emissions rates for six different cars, each driven by three different drivers. The question of interest is whether the mean emission rate differs across the 3 drivers. Since the values within each car will tend to be similar, the cars are treated as blocks in this experimental design. Use Friedman's Test to test for a difference among drivers. Use a significance level of 0.05. Give the null and alternative hypotheses, test statistic value, decision rule, and p-value. If there is a significant difference among drivers, then which drivers differ from each other?

	Driver		
Car	1	2	3
1	6.2	6.3	6.0
2	12.6	12.9	12.7
3	10.2	10.6	9.8
4	13.0	13.1	13.0
5	5.6	5.9	5.5
6	8.1	8.1	7.8

2) [Required for graduate students, extra credit for undergrads] A random sample of three men and a random sample of five women were asked their ages when they went on their first date. The three men responded with ages 15, 17, 16, while the five women responded with ages 12, 14, 15, 10, 12. Using a randomization test and $\alpha = 0.05$, test whether girls tend to be younger on their first date. Give the null and alternative hypotheses, test statistic value, and p-value.

3)[Required for graduate students, extra credit for undergrads] Two highway patrolmen kept track of how many tickets they wrote over a period of seven days. The same seven-day period was used for both patrolmen. The first patrolmen wrote 17, 15, 12, 9, 17, 18, 14 tickets over these days, and the second patrolmen wrote 14, 14, 15, 7, 16, 18, 10 tickets over the same set of seven days. Using a randomization test and $\alpha = 0.05$, test whether the two patrolmen tend to write the same number of tickets per day, on average. Give the null and alternative hypotheses, test statistic value, and p-value.

4) The count of the number of eggs rejected from a shipped crate of eggs was recorded for a random sample of eight crates of eggs. The counts of rejected eggs for the 8 crates were: 4, 0, 2, 0, 2, 0, 2, 0.
(a) Use the Kolmogorov test (at $\alpha = 0.05$) to determine whether it is reasonable to assume the counts follow a Poisson distribution with mean 1.5. Give the null and alternative hypotheses, test statistic value, and p-value.
(b) Give a 95% confidence band for the true c.d.f. of this distribution of counts.

5) The nitrous oxide emissions of a random sample of 12 cars was measured, yielding the data: 4.8, 6.2, 6.0, 5.9, 6.6, 5.5, 5.8, 5.9, 6.3, 6.6, 6.2, 5.0. Use the Kolmogorov test (at $\alpha = 0.05$) to determine whether it is reasonable to assume the counts follow a normal distribution with mean 5.6 and standard deviation 1.2. Give the null and alternative hypotheses, test statistic value, and p-value.

6) A random sample of fifteen entering freshmen had achievement scores:
481,620,642,515,740,562,395,615,596,618,525,584,540,580,598
Use the Lilliefors test (at $\alpha = 0.05$) to test whether these data follow a normal distribution. Give the null and alternative hypotheses, test statistic value, and p-value.

7) The times between arrivals of a random sample of 15 customers at a store were:
3.6,6.2,12.7,14.2,38,3.8,10.8,6.1,10.1,22.1,4.2,4.6,1.4,3.3,8.2
Use the Lilliefors test (at $\alpha = 0.05$) to test whether these data follow a exponential distribution. Give the null and alternative hypotheses, test statistic value, and p-value.

8) A random sample of five 6^{th}-grade boys from East Bumdoodle scored the following on a literacy test: 82,74,87,86,75. A random sample of eight 6^{th}-grade boys from West Bumdoodle scored the following on that literacy test: 88,77,91,88,94,93,83,94. Use the Smirnov test (at $\alpha = 0.05$) to test whether the two towns' populations of 6^{th}-grade boys' literacy scores follow the same distribution. Give the null and alternative hypotheses, test statistic value, and p-value.