Homework 3

Due on Nov 5, 2:30pm.

Problem 1
Below is a fictitious data set:
Treatment1 10 15 49
Treatment2 12 17 18.

a) Carry out the two-sample t-test to investigate if the mean of treatment1 is significantly larger than the mean of treatment2.

b) Let the test statistic D be the sample mean difference from two treatment groups. Find the (exact) permutation distribution of D under the null hypothesis that two populations have the same distribution. Use the permutation test to find the p-value for the observed data.

c) If we use the sum of the observations from treatment 1 as our test statistic, will the p-value be different from part (b)? Why?

d) If we use the sample median difference as our test statistic, will the p-value be different from part (b)? Which test statistic do you recommend?

Problem 2
Consider the following data, which record the carapace lengths (in mm) of crayfish for samples from two sections of a stream in Kansas.
Section1 17 14 15 21 19 13. Section2 5 11 16 8 12

a) Conduct a size 0.05 significance test using the Wilcoxon rank-sum statistic.

b) Compute the p-value of the Wilcoxon rank-sum test using the normal approximation.

c) Obtain the 90% confidence interval for the location shift parameter Δ.

d) Use Siegel-Tukey test to check the equality of the scales of these two sections.

e) Explain how you could use the permutation proceudre to test on the equality of deviances. Be specific about the test statistic you use and how you draw your conclusion.