Stat 8680: Applied Nonparametric Methods

Assignment I

1. A library has on its shelves 250 books on statistics. A student takes a random sample of 12 and wants to test the hypothesis that the median number of pages, θ, in all 250 books is 225. The number of pages in the sample are:

   126, 142, 156, 228, 245, 246, 370, 419, 433, 454, 478, 503

   Test H_0: $\theta = 225$ against the alternative H_1: $\theta > 225$ at significance level 0.05 using
   (a). The sign test
   (b). Normal approximation to the sign test
   (c). The Wilcoxon signed rank test
   (d). Normal approximation to the Wilcoxon signed rank test
   (e). t-test (Assuming the data is from normal distribution)
   (f). Did you reach the same conclusions with the above five approaches? If not, explain.

2. The systolic blood pressures of 11 patients are measured before and after administration of a drug.

Before, x	110, 126, 102, 108, 105, 98, 114, 98, 109, 122, 89
After, y	103, 121, 90, 111, 110, 96, 100, 80, 90, 101, 88

   We assume that the treatment effect (i.e. difference) follows a symmetrical distribution with median θ.

   (a). Using order statistics, find an estimate of θ and a confidence interval for θ which is closest to 95% level.
   (b). Find the Hodges-Lehman estimate of θ and construct a confidence interval for θ which is closest to 95% level by using Tukey's method.
   (c). Do you think the sample provides evidence that the drug causes a significant change in blood pressure?

3. **Problem 3.12 (page 81)**

4. **Problem 3.13 (page 81)**

5. **Problem 3.17 (page 81)**

STAT 8680 Applied Nonparametric Methods

Assignment 1.

*3.12 Kimura and Chikuni (1987) give data for lengths of Greenland turbot of various ages sampled from commercial catches in the Bering Sea as aged and measured by the Northwest and Alaska Fisheries Center. For 12-year-old turbot the numbers of each length were:

Length (cm)	64	65	66	67	68	69	70	71	72	73	75	77	78	83
No. of fish	1	2	1	1	4	3	4	5	3	3	1	6	1	1

Would you agree with someone who asserted that, on this evidence, the median length of 12-year-old Greenland turbot was almost certainly between 69 and 72 cm?

3.13 Use the Wilcoxon signed-rank test to test the hypothesis that the median length of 12-year-old turbots is 73.5 using the data in Exercise 3.12.

*3.17 A parking attendant notes the time cars have been illegally parked after their metered time has expired. For 16 offending cars he records the time in minutes as:

10 42 29 11 63 145 11 8 23 17 5 20 15 36 32 15

Obtain an appropriate 95 percent confidence interval for the median overstay time of offenders prior to detection. What assumptions were you making to justify using the method you did? To what population do you think the confidence interval you obtained might apply?