

**Exercises:**

I. If we have two independent samples A and B with the following data:

A	7	5.5	2.5	6	3	4.5	7.5	8.5
B	3	7	5	1.5	2	3	6.5	9

Can we conclude that the mean (median) of sample A is greater than the median of sample B at  $\alpha = 0.05$ .

Solution:

1. Hypotheses:

$$H_0: \mu_1 - \mu_2 = 0$$

$$H_a: \mu_1 - \mu_2 > 0$$

2. Test statistic:

1.5	2	2.5	3	3	3	4.5	5	5.5	6	6.5	7	7	7.5	8.5	9
1	2	3	5	5	5	7	8	9	10	11	12.5	12.5	14	15	16
B	B	A	A	B	B	A	B	A	A	B	A	B	A	A	B

$$W = 3 + 5 + 7 + 9 + 10 + 12.5 + 14 + 15 = 75.5$$

3. R.R:

Rject  $H_0$  if

$$W \geq c_1$$

$$c_1 = 84$$

4. Decision:

Since  $W = 75.5 \not\geq 84$  we cannot reject  $H_0$  which mean that the mean (median) of sample A is equal to the median of sample B

II. A random sample of 15 automobile mechanics certified to work on a certain type of car was selected, and the time (in minutes) necessary for each one to diagnose a particular problem was determined, resulting in the following data:

30.6, 30.1, 15.6, 26.7, 27.1, 25.4, 35.0, 30.8, 31.9, 53.2, 12.5, 23.2, 8.8, 24.9, 30.2

Use the Wilcoxon test at significance level .10 to decide whether the data suggests that true average diagnostic time is less than 30 minutes. Use  $\alpha = 0.05$

1. Hypotheses:

$$H_0: \mu = 30$$

$$H_a: \mu < 30$$

2. Test statistic:

30.6	30.1	15.6	26.7	27.1	25.4	35	30.8	31.9	53.2	12.5	23.2	8.8	24.9	30.2
0.6	0.1	-14.4	-3.3	-2.9	-4.6	5	0.8	1.9	23.2	-17.5	-6.8	-21.2	-5.1	0.2
3	1	12	7	6	8	9	4	5	15	13	11	14	10	2

$$S_+ = 3 + 1 + 9 + 4 + 5 + 15 + 2 = 39$$

Exercises for chapter 15

3. R.R: Reject  $H_0$  if

$$S_+ \leq \frac{n(n+1)}{2} - c_1$$
$$c_1 = 89 \Rightarrow \frac{n(n+1)}{2} - c_1 = 31$$

4. Decision:

Since  $S_+ = 39 \not\leq 31$  we cannot reject  $H_0$ . Hence, the true average diagnostic time is equal to 30 minutes.