15.3. Observations from two random and independent samples are drawn from two populations. Use the Wilcoxon rank sum test to determine if there is significant evidence that population P1 is, on average, to the left of population P2.

<table>
<thead>
<tr>
<th>P1</th>
<th>1</th>
<th>3</th>
<th>2</th>
<th>3</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>4</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

Rank the data in increasing order. Underline P1 items.

H0: P1 = P2
Ha: P1 < P2

T1 interval: [Tmin, Tmax] =
Acceptance region for T1:

Conclusion:

15.5. You wish to test if population P1 is significantly to the right of population P2.

n1 = 12, n2 = 14, T1 = 193. Conclusion?

T1 interval:
Tmid =
Acceptance region for T1:

Conclusion:

15.7. A memory drug is tested to see if it can improve the memories of senior males (S) aged 65-70 to a level equal to that of young males (Y) in their 20’s. Nonsense syllables given to each male. Five minutes later a count is taken of the number of syllables which could be recalled. Is there a significant difference in the number of syllables recalled by the medicated seniors and the number recalled by the young males?

<table>
<thead>
<tr>
<th>Y</th>
<th>11</th>
<th>7</th>
<th>6</th>
<th>8</th>
<th>6</th>
<th>9</th>
<th>2</th>
<th>10</th>
<th>3</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>1</td>
<td>9</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>7</td>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

Rank the data in increasing order. Since n1 = n2, we can choose either group to be the population 1. Pick P1 = S.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>3</th>
<th>5</th>
<th>6</th>
<th>6</th>
<th>6</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>11</td>
</tr>
</tbody>
</table>

T1 interval: [Tmin, Tmax] =
Warning H0 can involve =, ≤, ≥, but not <, > which are for Ha.

H0: Savg = Yavg
Ha: S ≠ Yavg

T1 = 102
n1 = 10, n2 = 10,
Tα/2 = 78, 
T1-α/2 = 78* = 55 + 155 - 78 = 132
Acceptance region for T1: [78, 132]

Conclusion? No significant difference.

For Lecture 35. Redo this problem but time, use the Normal Approximation Theorem rather than the T-distribution of Table 7.

\[ \mu_T = \sqrt{n_2 T_{mid}/6} = 13.23 \] \[ \alpha = .05, \quad z_{0.025} = 1.96 \]

Acceptance interval = \[ \mu_T \pm z_{0.025}\sigma_T = 105 \pm (1.96)(13.23) = [79.07, 130.91] \].

Confidence interval = \[ T_1 \pm z_{0.025}\sigma_T = 102 \pm (1.96)(13.23) = [76.07, 127.93] \].

\[ z = (T_1 - \mu_T)/\sigma_T = (102-105)/13.23 = -0.2268 \]

\[ p-value \approx 2 \times (0.5 - 0.01) = 0.818 \]

Conclusion No significant difference.