HOMEWORK #19 – SOLUTIONS

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4) \[ H_0: M = 83 \quad n(+) = 4 \quad \alpha = .01 \quad n = 14 \]
\[ H_a: M \neq 83 \quad n(−) = 10 \quad x_{crit} = 1 \]
\[ x^* = \min(4,10) = 4 > 1 = x_{crit} \Rightarrow DNR \, H_0 \]
At the 1% LOS, the median high temperature is 83°.

10) \[ H_0: M \geq 32 \quad n(+) = 13 \quad n = 18 \quad \alpha = .05 \]
\[ H_a: M < 32 \quad (\text{claim}) \quad n(−) = 5 \quad x_{crit} = 5 \]
\[ x^* = \min(13,5) = 5 = x_{crit} \Rightarrow \text{reject } H_0. \]
At the 5% LOS, the claim is correct—the median age is less than 32.

12) \[ H_0: M = 1000 \quad n(+) = 15 \quad n = 20 \quad \alpha = .10 \]
\[ H_a: M \neq 1000 \quad n(−) = 5 \quad x_{crit} = 5 \]
\[ x^* = \min(15,5) = 5 = x_{crit} \Rightarrow \text{reject } H_0. \]
At the 10% LOS, the median square footage is not 1000 square feet—the claim is not valid.

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4) \[ H_0: \text{there is no difference in salaries.} \]
\[ H_a: \text{there is a difference in salaries.} \]

<table>
<thead>
<tr>
<th>Sample</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>2</td>
</tr>
<tr>
<td>39</td>
<td>2</td>
</tr>
<tr>
<td>41</td>
<td>3</td>
</tr>
</tbody>
</table>
\[
\begin{array}{ccc}
43 & 2 & 4 \\
47 & 1 & 5 \\
49 & 1 & 6.5 \\
49 & 2 & 6.5 \\
50 & 1 & 8.5 \\
50 & 2 & 8.5 \\
52 & 2 & 10 \\
53 & 1 & 11 \\
56 & 1 & 13 \\
56 & 1 & 13 \\
56 & 2 & 13 \\
58 & 1 & 15 \\
59 & 1 & 16.5 \\
59 & 2 & 16.5 \\
61 & 1 & 18.5 \\
61 & 2 & 18.5 \\
64 & 1 & 20 \\
\end{array}
\]

\[
n_1 = 10 = n_2 \quad \sum \text{ranks of sample } 1 = 127 = R
\]

\[
\mu_R = \frac{n_1(n_1 + n_2 + 1)}{2} = \frac{10(10 + 10 + 1)}{2} = 105
\]

\[
\sigma_R = \sqrt{\frac{n_1n_2(n_1 + n_2 + 1)}{12}} = \sqrt{\frac{10 \cdot 10 \cdot (10 + 10 + 1)}{12}} = 13.229
\]

\[
z^* = \frac{R - \mu_R}{\sigma_R} = \frac{127 - 105}{13.229} = 1.663
\]

\textit{critical region} : \(z < -1.645, \ z > 1.645\)

\[\therefore \text{reject } H_0.\] At the 10% LOS, reject the claim--there is a difference in salaries.

6) 

\(H_0 :\) there is no difference in the number of months

\(H_a :\) there is a difference in the number of months

\[
\begin{array}{cc}
\text{Sample} & \text{Rank} \\
10 & 1 \\
\end{array}
\]
\[
\begin{array}{ccc}
11 & 1 & 2 \\
12 & 1 & 3 \\
13 & 2 & 4 \\
15 & 1 & 5 \\
17 & 1 & 6 \\
19 & 2 & 7 \\
21 & 1 & 9 \\
21 & 1 & 9 \\
21 & 2 & 9 \\
22 & 2 & 11 \\
23 & 2 & 12 \\
24 & 1 & 13.5 \\
24 & 1 & 13.5 \\
25 & 2 & 15 \\
26 & 2 & 16 \\
27 & 2 & 17.5 \\
27 & 2 & 17.5 \\
28 & 2 & 20 \\
28 & 2 & 20 \\
28 & 1 & 20 \\
30 & 1 & 22 \\
32 & 2 & 23 \\
\end{array}
\]

\(n_1 = 11, n_2 = 12\) \(\sum \text{ranks of sample 1} = 104 = R\)

\[
\mu_R = \frac{11(11+12+1)}{2} = 132
\]

\[
\sigma_R = \sqrt{\frac{11(12)(11+12+1)}{12}} = 16.248
\]

\[
z^* = \frac{104 - 132}{16.248} = -1.723
\]

\textit{critical region: } \(z < -2.575, \quad z > 2.575\)

\(\therefore DNR \ H_0\). At the 1% LOS, there is no difference in the number of months mothers in these two age groups breast-feed their babies.