# Chapter Problems 6

**Answer the following. (3 pts ea)**

1. A company is evaluating the impact of a wellness program offered on-site as a means of reducing employee sick days. A total of 8 employees agree to participate in the evaluationwhich lasts 12 weeks. Their sick days in the 12 months prior to the start of the wellness program and again over the 12 months after the completion of the program are recorded and are shown below. Is there a significant reduction in the number of sick days taken after completing the wellness program? **Use the Sign Test at a 5% level of significance.**

Complete the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Employee | Sick Days Taken in 12 Months Prior to Program | Sick Days Taken in 12 Months Following program | Difference (**Reduction** = **Prior-After** ) | Sign |
| 1 | 8 | 7 | () | () |
| 2 | 6 | 6 | () | ( ) |
| 3 | 4 | 5 | () | () |
| 4 | 12 | 11 | () | () |
| 5 | 10 | 7 | () | () |
| 6 | 8 | 4 | () | () |
| 7 | 6 | 3 | () | () |
| 8 | 2 | 1 | () | () |

Alpha= \_\_\_\_\_\_\_\_

n= \_\_\_\_\_\_\_\_

Critical value= \_\_\_\_\_\_\_\_

Smaller of the number of positive or negative signs=\_\_\_\_\_\_\_\_

Based on comparing the smaller of the number of positive or negative signs to the Critical value which of the following is (are) true?

1. There is statistically significant evidence at alpha=0.05 to show that the median difference(reduction) is positive.
2. There is not statistically significant evidence at alpha=0.05 to show that the median difference (reduction) is positive.
3. There are not enough data points to reach a conclusion.
4. The tied value makes the analysis suspect.
5. A small study (n=10) is designed to assess if there is an association between smoking in pregnancy and low birth weight. Low birth weight babies are those born less than 5.5 pounds. The following data represent the birth weights, in pounds, of babies born to mothers who reported smoking in pregnancy and those who did not.

Mother smoked in pregnancy 5.0 4.2 4.8 3.3 3.9

Mother did not smoke during pregnancy 5.1 4.9 5.3 5.4 4.6

Is there a significant difference in birth weights between mother who smoked during pregnancy and those who did not? Apply the Mann Whitney U Test ata 5% level of significance.

Complete the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Total Sample (Ordered Smallest to Largest) | Ranks |
| Mother Smoked in Pregnancy | Mother Did Not Smoke in Pregnancy | Rank | Smoked | Did Not Smoke | Smoked | Did Not Smoke |
| 5.0 | 5.1 | 1 | 3.3 |  |  |  |
| 4.2 | 4.9 | 2 |  |  |  |  |
| 4.8 | 5.3 | 3 |  |  |  |  |
| 3.3 | 5.4 | 4 |  | 4.6 |  |  |
| 3.9 | 4.6 | 5 |  |  |  |  |
|  |  | 6 |  |  |  |  |
|  |  | 7 |  |  |  |  |
|  |  | 8 |  |  |  |  |
|  |  | 9 |  |  |  |  |
|  |  | 10 |  |  |  |  |
|  |  |  |  |  | R1=\_\_\_\_ | R2=\_\_\_\_ |

2. *cont.*





Alpha= \_\_\_\_\_\_\_\_

N1= \_\_\_\_\_\_\_\_

N2=\_\_\_\_\_\_\_\_

Critical value U= \_\_\_\_\_\_\_\_

Smaller of U1 and U2 = \_\_\_\_\_\_\_\_

Based on comparing the Smaller of U1 and U2 to the Critical value which of the following is (are) true?

1. There is significant evidence at alpha=0.05 to show that the populations of birth weights in mothers who smoked in pregnancy and those who did not are not equal.
2. There is not significant evidence at alpha =0.05 to show that the populations of birth weights in mothers who smoked in pregnancy and those who did not are not equal.
3. There are not enough data points to reach a conclusion.
4. The tied value makes the analysis suspect.
5. The recommended daily allowance of Vitamin A for children between 1 and 3 years of age is 400 micrograms (mcg). Vitamin A deficiency is linked to a number of adverse health outcomes including poor eyesight, susceptibility to infection, and dry skin. The following are Vitamin A concentrations in children with and without poor eyesight, a history of infection and dry skin.

With poor eyesight, a history 270 420 180 345 390 430

of infection and dry skin.

Free of poor eyesight, a history 450 500 395 380 430

of infection and dry skin.

Is there a significant difference in Vitamin A concentrations between children with and without poor eyesight, a history of infection and dry skin? Apply the Mann Whitney U Test a 5% level of significance.

Complete the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Total Sample (Ordered Smallest to Largest) | Ranks |
| With infection | Free of infection | Rank | With infection | Free of infection | With infection | Free of infection |
| 270 | 450 | 1 | 180 |  |  |  |
| 420 | 500 | 2 |  |  |  |  |
| 180 | 395 | 3 |  |  |  |  |
| 345 | 380 | 4 |  | 380 |  |  |
| 390 | 430 | 5 |  |  |  |  |
| 430 |  | 6 |  |  |  |  |
|  |  | 7 |  |  |  |  |
|  |  | 8 |  |  |  |  |
|  |  | 10 |  |  |  |  |
|  |  | 11 |  |  |  |  |
|  |  |  |  |  | R1=\_\_\_\_ | R2=\_\_\_\_ |

3. *cont.*





Alpha= \_\_\_\_\_\_\_\_

N1= \_\_\_\_\_\_\_\_

N2 = \_\_\_\_\_\_\_\_

Critical value U= \_\_\_\_\_\_\_\_

Smaller of U1 and U2 = \_\_\_\_\_\_\_\_

Based on comparing the Smaller of U1 and U2 to the Critical value which of the following is (are) true?

1. There is statistically significant evidence at α=0.05 to show that the populations of Vitamin A concentrations in children with and without poor eyesight, a history of infection and dry skin are not equal.
2. There is not statistically significant evidence at α=0.05 to show that the populations of Vitamin A concentrations in children with and without poor eyesight, a history of infection and dry skin are not equal.
3. There are not enough data points to reach a conclusion.
4. The tied value makes the analysis suspect.

1. A study is conducted to assess the potential benefits of an ayurvedic treatment to reduce high cholesterol. Seven patients agree to participate in the study. Each has their cholesterol measured at the start of the study and then again after 4 weeks taking a popular herb called arjuna. Assess whether there is there a difference in total cholesterol after taking the herb using the **Wilcoxon Signed Rank Test at a 5% level of significance.**

Compete the tables below.

|  |  |  |  |
| --- | --- | --- | --- |
| Participant | Total CholesterolBefore Treatment | Total CholesterolAfter Treatment | Difference (Before-After ) |
| 1 | 250 | 241 |  |
| 2 | 265 | 260 |  |
| 3 | 240 | 253 |  |
| 4 | 233 | 230 |  |
| 5 | 255 | 224 |  |
| 6 | 275 | 227 |  |
| 7 | 241 | 232 |  |

|  |  |  |
| --- | --- | --- |
| Ordered Absolute Values of Differences | Ranks | Signed Ranks |
| 3 |  |  |
| 5 |  |  |
| 9 |  |  |
| 9 |  |  |
| 13 |  |  |
| 31 |  |  |
| 48 |  |  |
| Total=> | 28 |  |

W+ = 23 and W- = 5 (Recall that the sum of the ranks, ignoring the signs, will always equal n(n+1)/2 = 7(8)/2.

The test statistic = \_\_\_\_\_\_\_\_

Alpha= \_\_\_\_\_\_\_\_

n= \_\_\_\_\_\_\_\_

Critical value= \_\_\_\_\_\_\_\_

Smaller of the number of positive or negative signs \_\_\_\_\_\_\_\_

4. *cont.*

Based on comparing the smaller of the number of positive or negative signs to the Critical value which of the following is (are) true?

1. There is statistically significant evidence at alpha=0.05 to show that the median difference is positive.
2. There is not statistically significant evidence at alpha=0.05 to show that the median
difference is positive.
3. There are not enough data points to reach a conclusion.
4. The tied value makes the analysis suspect.
5. An investigator wants to test if there is a difference in endotoxin levels in children who are exposed to endotoxin as a function of their proximity to operating farms. The following are endotoxin levels in units per milligram of dust sampled from children’s mattresses, organized by children’s proximity to farms.

Within 5 Miles 54 62 78 90 70

5-24.9 Miles 28 42 39 81 65

25-49.9 Miles 37 29 30 50 53

50 Miles or More 36 19 22 28 27

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | Total Sample (Ordered Smallest to Largest) |
| < 5 Miles | 5-24.9 Miles | 25-49.9 Miles | 50+ Miles | < 5 Miles | 5-24.9 Miles | 25-49.9 Miles | 50+ Miles |
|  |  |  |  |  |  |  |  |
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Apply the Kruskal Wallis test at a 5% level of significance.

Alpha= \_\_\_\_\_\_\_\_

df= \_\_\_\_\_\_\_\_

Critical value=\_\_\_\_\_\_\_\_

H= \_\_\_\_\_\_\_\_

Based on comparing H to the critical value to the Critical value which of the following is (are) true?

1. There is significant evidence at alpha=0.05 t o show that the populations of endotoxin levels in children living varying distances from operating farms are not equal.
2. There is not significant evidence at alpha =0.05 to show that the populations of endotoxin levels in children living varying distances from operating farms are not equal.
3. There are not enough data points to reach a conclusion.
4. The tied value makes the analysis suspect.