## Quiz 1

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| STAT 333  | Academic year 1441 H | Send you answer before 12/3/2020 -9:00PM |
| Non-Parametric Statistics | Second Semester | By E-mail for: wemam.c@ksu.edu.sa |

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1. Male high school students completed the 1-mile run at the end of their 9th grade and the beginning of their 10th grade. The following values represent the differences between the recorded times. Notice that only one student’s time improved (−2: 08). Rank the values in Table 1 beginning with the student’s time difference that displayed improvement.

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| **TABLE 1** |  |
| Participant | Value | Rank |
| 1 | 0 : 36 |  |
| 2 | 0 : 28 |  |
| 3 | 1 : 41 |  |
| 4 | 0 : 37 |  |
| 5 | 1 : 01 |  |
| 6 | 2 : 30 |  |
| 7 | 0 : 44 |  |
| 8 | 0 : 47 |  |
| 9 | 0 : 13 |  |
| 10 | 0 : 24 |  |
| 11 | 0 : 51 |  |
| 12 | 0 : 09 |  |
| 13 | −2 : 08 |  |
| 14 | 0 : 12 |  |
| 15 | 0 : 56 |  |

1. The values in Table 2 represent weekly quiz scores on math. Rank the quiz scores.

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| **TABLE 2** |  |
| Participant | Score | Rank |
| 1 | 100 |  |
| 2 | 60 |  |
| 3 | 70 |  |
| 4 | 90 |  |
| 5 | 80 |  |
| 6 | 100 |  |
| 7 | 80 |  |
| 8 | 20 |  |
| 9 | 100 |  |
| 10 | 50 |  |

1. Using the data from the previous example, what are the counts (or frequencies) of passing scores and failing scores if a 70 is a passing score?
2. The data in Table 3 were obtained from a reading-level test for 1st-grade children. Compare the performance gains of the two different methods for teaching reading.

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| **TABLE 3.** |  |
| Method | Gain score | Method | Gain score |
| One on one | 16 | Small group | 11 |
| One on one | 13 | Small group | 2 |
| One on one | 16 | Small group | 10 |
| One on one | 16 | Small group | 4 |
| One on one | 13 | Small group | 9 |
| One on one | 9 | Small group | 8 |
| One on one | 12 | Small group | 5 |
| One on one | 12 | Small group | 6 |
| One on one | 20 | Small group | 4 |
| One on one | 17 | Small group | 16 |

Use two-tailed Mann–Whitney U and Kolmogorov–Smirnov two-sample tests to determine which method was better for teaching reading. Set α = 0.05. Report your findings.

1. A research study was conducted to see if an active involvement in a hobby had a positive effect on the health of a person who retires after age 65. The data in Table 4 describe the health (number of doctor visits in 1 year) for participants who are involved in a hobby almost daily and those who are not.

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| **TABLE 4** |  |
| No hobby group | Hobby group |
| 12 | 9 |
| 15 | 5 |
| 8 | 10 |
| 11 | 3 |
| 9 | 4 |
| 17 | 2 |

Use one-tailed Mann–Whitney *U* and Kolmogorov–Smirnov two-sample tests to determine whether the hobby tends to reduce the need for doctor visits. Set $α$= 0.05. Report your findings.

1. Table 5 shows assessment scores of two different classes who are being taught computer skills using two different methods.

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| **TABLE 5** |  |
| Method 1 | Method 2 |
| 53 | 91 |
| 41 | 18 |
| 17 | 14 |
| 45 | 21 |
| 44 | 23 |
| 12 | 99 |
| 49 | 16 |
| 50 | 10 |

Use two-tailed Mann–Whitney *U* and Kolmogorov–Smirnov two-sample tests to determine which method was better for teaching computer skills. Set $α$= 0.05. Report your findings.

1. A teacher wished to determine if providing a bilingual dictionary to students with limited English proficiency improves math test scores. A small class of students (*n* = 10) was selected. Students were given two math tests. Each test covered the same type of math content; however, students were provided a bilingual dictionary on the second test. The data in Table 6 represent the students’ performance on each math test.

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| **TABLE 6.** |  |
| Student | Math test without a bilingual dictionary | Math test with a bilingual dictionary |
| 1 | 30 | 39 |
| 2 | 56 | 46 |
| 3 | 48 | 37 |
| 4 | 47 | 44 |
| 5 | 43 | 32 |
| 6 | 45 | 39 |
| 7 | 36 | 41 |
| 8 | 44 | 40 |
| 9 | 44 | 38 |
| 10 | 40 | 46 |

Use a one-tailed Wilcoxon signed rank test and a one-tailed sign test to determine which testing condition resulted in higher scores. Use = 0.05. Report your findings.

1. A research study was done to investigate the influence of being alone at night on the human male heart rate. Ten men were sent into a wooded area, one at a time, at night, for 20 min. They had a heart monitor to record their pulse rate. The second night, the same men were sent into a similar wooded area accompanied by a companion. Their pulse rate was recorded again. The researcher wanted to see if having a companion would change their pulse rate. The median rates are reported in Table 7. Use a two-tailed Wilcoxon signed rank test and a two-tailed sign test to determine which condition produced a higher pulse rate. Use α = 0.05. Report your findings.

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| **TABLE 7.** |  |  |
| Participant | Median rate alone | Median rate with companion |
| A | 88 | 72 |
| B | 77 | 74 |
| C | 91 | 80 |
| D | 70 | 77 |
| E | 80 | 71 |
| F | 85 | 83 |
| G | 90 | 80 |
| H | 82 | 91 |
| I | 93 | 86 |
| J | 75 | 69 |

1. A researcher conducts a pilot study to compare two treatments to help obese female teenagers lose weight. She tests each individual in two different treatment conditions. The data in Table 8 provide the number of pounds that each participant lost.

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| **TABLE 8.** |  |
|  |  | Pounds lost |  |
| Participant | Treatment 1 |  | Treatment 2 |
| 1 | 10 |  | 18 |
| 2 | 20 |  | 12 |
| 3 | 15 |  | 16 |
| 4 | 9 |  | 7 |
| 5 | 18 |  | 21 |
| 6 | 11 |  | 17 |
| 7 | 6 |  | 13 |
| 8 | 12 |  | 14 |

Use a two-tailed Wilcoxon signed rank test and a two-tailed sign test to determine which treatment resulted in greater weight loss. Use *α* = 0.05. Report your findings.

1. Two techniques used to teach a course of nonparametric statistics. The first technique apply on the students study the course at King Saud University while the second technique apply on the students study the course at King Abdulaziz University. The students were tested and the test results are shown in the next table.

**Technique 1**: 40 50 41 48 53 39 38

**Technique 2**: 18 10 12 102 17 20 14

Use Mann−Whitney U-Test (by hand method) at level of risk α = 0.025 and answer the following questions:

1. The null hypothesis (HO) is

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| --- | --- | --- | --- |
| (A) | There is no tendency for ranks of one technique to be significantly higher than the other | (B) | There is a tendency for ranks of one technique to be significantly lower than the other |
| (C) | There is no tendency for ranks of one technique to be significantly higher (or lower) than the other | (D) | There is a tendency for ranks of one technique to be significantly higher than the other |

1. The research hypothesis (HA) is:

|  |  |  |  |
| --- | --- | --- | --- |
| (A) | The ranks of one method are systematically higher (or lower) than the other | (B) | The ranks of one method are systematically higher than the other |
| (C) | The ranks of one method are systematically lower than the other | (D) | The ranks of one method are systematically not equal the other |

1. The Mann−Whitney U-test statistic is the smaller of U1 and U2. Therefore, U =\_\_\_\_\_.

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| --- | --- | --- | --- |
| (A) | 70 | (B) | 35 |
| (C) | 7 | (D) | 42 |

1. The critical value for the Mann−Whitney U is \_\_\_\_\_\_\_\_

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| --- | --- | --- | --- |
| (A) | 8 | (B) | 15 |
| (C) | 22 | (D) | 30 |

1. Using the ranked reading comprehension test scores, the results indicated a \_\_\_\_\_\_\_\_\_ between the two methods

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| --- | --- | --- | --- |
| (A) | Significant difference  | (B) | No significant difference  |

1. Two techniques used to teach a course of nonparametric statistics. The first technique apply on the students study the course at King Saud University while the second technique apply on the students study the course at King Abdulaziz University. The students were tested and the test results are shown in the next table.

**Technique 1**: 40 50 41 48 53 39 38

**Technique 2**: 18 10 12 102 17 20 14

Use Kolmogorov–Smirnov two-sample test (**SPSS method**) at level of risk *α* = 0.05 and answer the following questions:

1. Dmax = \_\_\_\_\_\_\_\_

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| --- | --- | --- | --- |
| (A) | 0.234 | (B) | 0.547 |
| (C) | 0.857 | (D) | 0.921 |

1. Kolmogorov–Smirnov two-sample test statistic, Z = \_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- |
| (A) | 2.147 | (B) | 1.604 |
| (C) | 2.541 | (D) | 3.421 |

1. The two-tailed significance, the p-value = \_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- |
| (A) | 0.012 | (B) | 0.089 |
| (C) | 0.210 | (D) | 0.512 |

1. If we ask about the one-tailed significance, the level of risk will be \_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- |
| (A) | 0.10 | (B) | 0.05 |
| (C) | 0.025 | (D) | 0.975 |

1. The results from the Kolmogorov–Smirnov two-sample test indicate a \_\_\_\_\_\_\_\_\_ between the two techniques.

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| --- | --- | --- | --- |
| (A) | Significant difference  | (B) | No significant difference  |