1st EXAM IN STATISTICS_ANSWERS KEY

Exercise 1 (6 pts)**:** Determine whether the following statements are true (T) or false (F).

N°	Statements	T/F
1	When data are ranked in the Mann-Whitney U test, information about the precise differences between individual scores is preserved.	**F**
2	If two distributions in a Mann-Whitney U test have similar shapes, the test can be interpreted as comparing medians.	**T**
3	Visual inspection using boxplots or histograms is the only way to check whether two distributions have similar shapes.	**F**
4	Non-parametric tests frequently rely on the median as a measure of central tendency because they are designed for data that may violate normality assumptions or include outliers. The median is more robust in such cases, providing a reliable summary of the data's center.	**T**
5	The Mann-Whitney U test works by ranking all data points from both groups together and comparing the rank sums.	**T**
6	When distributions have different shapes, the Mann-Whitney U test detects differences in overall distribution patterns rather than median differences.	**T**

Exercise 2 (4 pts)**:** Briefly explain the following concepts:

1. Type I error:

The error that occurs when a researcher incorrectly rejects a true null hypothesis, concluding that a significant effect exists when in reality none does (false positive).

2. Statistical power :

The probability that a statistical test will correctly detect a real effect when one truly exists

3. The ranking process :

The process of assigning numerical positions to data values based on their relative magnitude, where the smallest value receives rank 1, the next smallest rank 2, and so on.

4. The dependent observations assumption :

The assumption that each data point or measurement is not influenced by, or related to any other data point.

Exercise 3 (6 pts)**:** Indicate what test is most suitable for the following research questions.

RQ1: Do male and female EFL students differ in their responses to a 5-point Likert-scale questionnaire about attitudes toward online English instruction?

a. ANOVA
b. Mann-Whitney U test
c. Pearson correlation
d. Paired t-test

RQ2: Are there significant differences in perceived academic stress levels between Algerian university students living in dormitories and those commuting from home?

a- Regression
b- Mann-Whitney U test
c- Brown and Smythe's test
d- t-test

RQ3: Is there a difference in Algerian bilingual (Arabic-French) and monolingual (Arabic-only) learners' perceived level of difficulty with English grammar?

a- ANOVA
b- Mann-Whitney U test
c- Chi-square for goodness of fit test
d- *t*-test

RQ4: Are there differences in students' willingness to communicate based on three levels of teacher immediacy: low, medium, and high?

a. ANOVA
b. Mann-Whitney U test
c. Pearson's r
d. Chi-square goodness-of-fit

RQ5: A teacher wants to know if students' pronunciation accuracy improves after a phonetics training program by comparing scores from the same students before and after training.

a- Independent t-test
b- Paired-samples t-test
c- Mann-Whitney U test
d- Chi-square test

RQ6: Do students from various cultural backgrounds—Asian, European, and Middle Eastern—differ significantly in their speaking proficiency test in a multicultural TEFL classroom?

a- ANOVA
b- Mann-Whitney U test
c- Chi-square for goodness of fit test
d- *t*-test

Exercise 4 (4pts): Analyse each scenario carefully and identify the error **(circle the letter corresponding to your answer)**

Scenario 1 : A study investigates whether year of study (first, second, or third year) affects the grammar accuracy of university students in academic writing. The researcher collects grammar scores and applies a Mann-Whitney U test.

a. The dependent variable is not suitable for Mann-Whitney U.
b. Mann-Whitney U test is not appropriate for more than two groups.
c. Grammar accuracy cannot be ranked.
d. The data is not non-parametric.

Scenario 2 : In an effort to compare students' motivation across four universities in different Algerian cities, a researcher distributes a motivation scale with 20 Likert-scale items to 50 students per university. She computes the average motivation scores and compares them using a one-way ANOVA.

a. The research design requires non-parametric analysis.
b. The test cannot be used with Likert-scale data.
c. The procedure does not match the aim.
d. There is no error.

Scenario 3 : A Master's student compared the same students' motivation levels at three time points (Week 1, Week 6, Week 12) using three separate paired-samples t-tests: Week 1 vs. Week 6, Week 1 vs. Week 12, and Week 6 vs. Week 12.

a) Paired-samples t-test cannot be used three times
b) Multiple paired t-tests increase Type I error risk; repeated measures ANOVA should be used
c) Motivation cannot be measured at multiple time points
d) The sample size was too small

Scenario 4 : A linguistics researcher wants to explore gender differences in students' self-rated oral fluency (measured on a 7-point Likert scale). She uses a Mann-Whitney U test after checking that the data distributions for males and females are dissimilar in shape.

a. The data is not ranked correctly.
b. The distributions should be the same shape to compare medians.
c. The Mann-Whitney U test cannot be used with Likert scales.
d. The sample size is too large for this test.