**Homework 7**

**Your student ID #**

|  |
| --- |
| **Homework Guidance**  To ensure the integrity and educational value of your work, please adhere to the following guidelines as you complete Homework 1:  **1) Originality and Collaboration**: You are encouraged to work independently and ensure that the submissions are your own. While collaboration with your peers for understanding concepts and discussing problems is allowed, directly copying work from your colleagues is strictly prohibited. Your submission should reflect your understanding and your ability to apply what you have learned.  **2) Use of GPT-like Platforms**: You are permitted to use GPT-like platforms for assistance with your homework. However, this tool should only be used when you fully understand the answers it provides. The purpose of using such platforms is to enhance your learning, not to bypass the learning process. ***Keep in mind that midterm and final exams will be conducted without internet access***. If there is a significant discrepancy between the code you submit for homework and your ability to write similar code during an exam, ***it will be considered cheating***. Such instances will result in a score of zero for the involved exam component.  **3) Submission Quality**: Your focus should be on submitting code that you comprehend thoroughly. Fancy or complex code that goes beyond your level of understanding is not the goal. We value honesty and genuine effort. Make sure that you can explain and justify every line of code you submit. This approach will not only help you in your homework but also prepare you for the no-internet exams. |

1. We aim to determine if there is a variation in concentration across sites with different land uses using the rank-sum test. Should this test be conducted with a one-sided or two-sided alternative hypothesis?

2. An initiative to clear molybdenum contamination from mine tailings has been implemented.

Assess if the molybdenum levels in the downstream wells are significantly reduced compared to those in the upstream wells. Additionally, verify if there is a significant change in the average molybdenum concentrations post-remediation.

**Well Concentrations (µg/L):**

| **Role** | **Concentration** |
| --- | --- |
| Downstream | 0.850 |
| Upstream | 6.900 |
| Downstream | 0.390 |
| Upstream | 3.200 |
| Downstream | 0.320 |
| Upstream | 1.700 |
| Downstream | 0.300 |
| Downstream | 0.300 |
| Downstream | 0.205 |
| Downstream | 0.200 |
| Downstream | 0.200 |
| Downstream | 0.140 |
| Downstream | 0.140 |
| Downstream | 0.090 |
| Downstream | 0.046 |
| Downstream | 0.035 |

3. Compare the yields, measured in gallons per minute per foot of water-bearing material, from wells in valleys with fractured rock to those in valleys without. Use the appropriate statistical test at a significance level of 0.05 to investigate if fracturing affects the average well yields.

A table of numbers with black text

Description automatically generated with medium confidence

(Well yields in fractured rock have a probability plot correlation coefficient (PPCC) of 0.943 (*p* >0.05). Well yields in unfractured rock have a PPCC of 0.806 (*p* <0.05).)

4. Reassess the hypothesis that the mean unit well yields from two sampling sites are equal against the alternative that one is greater than the other, using the rank-sum test. Consider how the test results are influenced by a detection limit for values below 0.050 reported as <0.05. Discuss whether a *t*-test would be appropriate in this context.