Nitrate Concentration assessment

Overview

A water supplier is abstracting groundwater from boreholes and wants to know the quality of the water before using it for supply. The WHO threshold for nitrate concentrations allowed in drinking water is 11.3 mg/l.

The data in the spread sheet represent observations of Nitrate concentrations (mg/l) in the boreholes. The column headings are the borehole identifiers and the dates are the first column.

Tasks

1. What are the highest, the lowest and the average concentrations measured over the entire time period in each of the boreholes (min, max, mean)?
2. Calculate which boreholes show concentrations above the threshold. At which dates are threshold concentrations exceeded?
3. Assuming it is only economically feasible to treat the abstracted water if 75 % of the sampled water has concentrations below 6 mg/l – which boreholes shall be used for supply? (75% is the 3rd quartile)
4. On average does the data vary more in between different sample dates or more for different locations? (You can assess this by calculating the average of the variances for borehole station/dates!) What is the average variance for i) dates, ii) locations
5. Plot the temporal trends in the groundwater concentrations for boreholes B2, D3, G1 and H3. Are the concentrations generally rising or falling over the observation period in borehole:

Submit to me:

1. A completed worksheet that provides the answers to the tasks/questions above. This should not contain code.
2. A fully commented script (.R file) that I can use to recreate your results

Some tips for good code presentation:

- Your script should begin with a brief description of what it does containing your name, the date and any other relevant information (e.g. submitted as part of the assessment for … etc.)
- Use consistent formatting and indentation to break the code in to coherent sections
- Use meaningful variable names
- Do not use overly long lines. Long thin code sections are easier to read.
- Comments should explain the functionality of each section.
- DON’T submit a script with my comments in it!

Marking Criteria	%	Excellent (100%)	Good (75%)	Adequate (50%)	Poor (25%)	Fail (0%)
Program Correctness	60	No errors, code works correctly and exactly matches the worksheet	Minor errors in code OR match to the worksheet	Minor errors in code AND in match to the worksheet	Major errors in code OR/AND in match to the worksheet	Major errors in code AND in match to the worksheet
Code commenting and layout	10	Logical comments, excellent readability, no errors	Less logical comments, good readability and minor errors	Less logical comments, good readability and major errors	Illogical comments, poor readability and minor errors	Illogical comments, poor readability and major errors
Code Efficiency	15	No errors. Code uses the best approach in every case.	No errors. Code uses the best approach in most cases.	Minor errors AND/OR Code uses approach that works but is not ideal	Major errors AND/OR code uses approach that works but is not ideal	Major errors AND/OR code does not work
Worksheet	15	No errors and neatly presented	No errors and not neatly presented	Some errors and neatly presented	Some errors and not neatly presented	Major errors and/or not neatly presented