White Exam

Master 222: Introduction to Python for Finance

September 24, 2024

Examination Instructions

- **Duration**: This exam is 2 hours long.
- **No Devices**: Use of computers, smartphones, or any internet-enabled devices is prohibited.
- **Code Language**: All code must be written in Python.
- **Indentation**: Proper indentation is crucial. It counts towards your grade.
- **Package Imports**: Any packages used should be imported at the start of each question.
- **Correction Indulgence**: Since this is a written code exam, some leniency will be given during correction.

Please read questions carefully and do your best. Good luck!

1 Basics and Fundamentals (6 points)

Problem 1. [1 point] Write a function called `occurrence` to count the occurrence of each vowel in a string.

Consider both uppercase and lowercase. It's advisable to use the 'in' keyword, as demonstrated below:

```python
my_list = [1, 2, 3, 4, 5]
if 3 in my_list:
    print("3 is in the list!")
```

Listing 1: Using 'in' keyword

Problem 2. [1 point] Create a list called `squared_numbers` containing the squares of numbers from 1 to 15.

Problem 3. [2 points] Create a function named `is_prime` to verify if a number is prime. Then, generate a list of prime numbers between 1 and 50.

A prime number is divisible only by 1 and itself. It's recommended to use Python's integer division rest `%`.

Problem 4. [2 points] Develop a function named `string_alternate` which, given a string, produces a new string containing one character over two.

For the input 'PythonExam', the function should return 'PtoEa'.

2 Numpy and Intermediate Data Analysis (6 points)

Problem 5. [1 point] Formulate a 4×4 numpy matrix `M` with numbers spanning from 1 to 16. Subsequently, print the matrix and its diagonal.

Problem 6. [1 point] Construct two random 3×3 matrices `X` and `Y`. Then, print the result of their matrix multiplication.

Problem 7. [2 points] Generate a numpy array `D` containing 200 random numbers between -1 and 1. Subsequently, compute and display its variance.

Consider using the `np.var()` *function from numpy to compute the variance.*

Problem 8. [1 point] Identify and print the indices in array `D` where values exceed 0.5.

Problem 9. [1 point] Adjust the values in array `D` to be rounded to two decimal places.

Hint: Refer to the official `numpy` *documentation excerpt below.*

```
numpy.round
------------
numpy.round(a, decimals=0, out=None)
    Evenly round to the given number of decimals.

    Parameters:
    - a (array_like): Input data.
    - decimals (int, optional): Number of decimal places to round to (default: 0).
      Negative values specify positions to the left of the decimal point.

    Returns:
    - ndarray: An array containing the rounded values.
```

3 Pandas, Matplotlib, and yfinance (8 points)

Problem 10. [2 points] Create a DataFrame named `df` using the dictionary data provided below:

```
data = {
    'Name': ['Alice', 'Bob', 'Charlie', 'David'],
    'Age': [25, 30, 35, 40],
    'Salary': [50000, 55000, 60000, 65000]
}
```

Subsequently, compute and display the average age and salary from `df`.

Hint: To compute the average of a column in a DataFrame, consider using the `mean()` method. For instance, `df['ColumnName'].mean()` would give the average of the specified column.

Problem 11. [2 points] Utilizing `matplotlib`, construct a bar graph representing the salary of each individual from the DataFrame `df`. Ensure the following elements are incorporated:

- A title for the graph.
- Label for the x-axis.
- Label for the y-axis.
- Names of the individuals displayed on the x-axis.

Hint: To create a bar graph using `matplotlib`*, you can utilize the* `bar()` *function from the* `pyplot` *module. It's similar of the using of* `plt`*.*

Problem 12. [2 points] Utilize the `yfinance` library to obtain the adjusted closing prices of the "AAPL" stock ticker for the recent 30 days. Store the retrieved data in a DataFrame.

Problem 13. [2 points] Using `matplotlib`, plot the 30-day closing prices of "AAPL". Ensure the graph incorporates the following details:

- x-axis labeled as "Date".
- y-axis labeled as "Closing Price".
- A title: "AAPL 30-day Closing Price".