Case Study 1: Sales Data Analysis

You are working with sales data for a small store. The data includes the number of items sold on each day for a month (30 days), and you have the sales data for 3 items: apples, oranges, and bananas.

The sales data is represented as a 2D NumPy array, where each row represents a day, and each column represents the sales data for an item.

Questions:

1. **Creating the Data**: How would you create a NumPy array representing the sales data for 30 days and 3 items, with random sales values between 0 and 100?
2. **Total Sales for Each Item**: Write the NumPy code to calculate the total sales for each item over the 30 days.
3. **Average Sales for Each Item**: Write the NumPy code to calculate the average sales for each item over the 30 days.
4. **Find Maximum Sales Day for Each Item**: Write the NumPy code to find the day with the maximum sales for each item.

Case Study 2: Student Grades

You are analyzing the grades of 5 students in 3 subjects: Math, Science, and English. The grades are stored in a 2D NumPy array, where each row represents a student and each column represents a subject.

Questions:

1. **Create the Grades Array**: How would you create a NumPy array to represent the grades of 5 students in 3 subjects?
2. **Find the Average Grade for Each Student**: Write the NumPy code to calculate the average grade for each student.
3. **Find the Highest Grade in Each Subject**: Write the NumPy code to find the highest grade in each subject.
4. **Find the Student with the Highest Total Grade**: Write the NumPy code to find the student with the highest total grade across all subjects.

Case Study 3: Temperature Analysis

You are working with temperature data for a week (7 days). You have temperatures for two cities, City A and City B.

Questions:

1. **Create the Temperature Array**: How would you create a NumPy array to represent the temperatures for 7 days in 2 cities?
2. **Find the Average Temperature for Each Day**: Write the NumPy code to calculate the average temperature for each day across the two cities.
3. **Find the Highest Temperature Recorded**: Write the NumPy code to find the highest temperature recorded across both cities.
4. **Find the City with the Highest Average Temperature**: Write the NumPy code to find which city had the highest average temperature.

Numpy questions

1. How to replace items that satisfy a condition with another value in numpy array?

```
arr = np.arange(10)
arr[arr%2 == 1] = -1
print(arr)
```

2. How to replace items that satisfy a condition without affecting the original array?

```
arr = np.arange(10)
out = arr.copy()
out[out%2 == 1] = -1
print('Modified Array‘,out)
 print('\nOriginal Array‘,arr)
```

3) Get the positions of top 5 maximum values in a given array a. np.random.seed(100)

```
a = np.random.uniform(1,50, 20)
sort = a.argsort()
print('Positions') sort[-5:][::-1]
 print('Values') a[sort][-5:][::-1]
```

4) Convert array_of_arrays into a flat linear 1d

```
array. arr1 = np.arange(3)
arr2 = np.arange(3,7)
arr3 = np.arange(7,10)
arr_2d = np.concatenate([arr1, arr2, arr3]) print(arr_2d)
```

5) You have the following dataset with some missing (NaN) values:

```
python
import numpy as np
data = np.array([10.5, 12.3, np.nan, 14.2, np.nan, 13.7])
```

Question:

- How many missing values are there?
- Replace NaNs with the mean of the non-NaN values

6) Given:scores = np.array([85, 87, 89, 90, 120, 91, 88, 86])

Question:

- Use z-score to detect outliers. Consider a z-score > 2 or < -2 as an outlier.

7) matrix = np.array([[3, 2, 1],
[6, 5, 4],
[9, 8, 7]])

Question:

- Sort each row in ascending order.
- Then sort the matrix by the values in the second column.

8) Create an 8X3 integer array from a range between 10 to 34 such that the difference between each element is 1 and then Split the array into four equal-sized sub-arrays.