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Data Science
Capsule-3 assignment

Q1) Write a Python program to initialize a 3x3 NumPy array with any integer values of your choice. Then, perform the following operations:
Multiply the entire array by 2.
Add 5 to each element of the array.
Calculate the square of each element in the array.
Print the original array and the results of each operation.

```
import numpy as np

# Initialize a 3x3 NumPy array with integer values
original_array = np.array([[1, 2, 3], [4, 5, 6], [7, 8, 9]])

# Multiply the entire array by 2
multiplied_array = original_array * 2

# Add 5 to each element of the array
added_array = original_array + 5

# Calculate the square of each element in the array
squared_array = original_array ** 2

# Print the original array and the results of each operation
print("Original array:")
print(original_array)
print("\nArray after multiplying by 2:")
print(multiplied_array)
print("\nArray after adding 5:")
print(added_array)
print("\nArray after squaring each element:")
print(squared_array)
```

```
... Original array:
[[1 2 3]
 [4 5 6]
 [7 8 9]]

Array after multiplying by 2:
[[ 2  4  6]
 [ 8 10 12]
 [14 16 18]]

Array after adding 5:
[[ 6  7  8]
 [ 9 10 11]
 [12 13 14]]

Array after squaring each element:
[[ 1  4  9]
 [16 25 36]
 [49 64 81]]
```

Q2) Write a Python program to initialize a 3x3 NumPy array with any integer values of your choice. Then, perform the following slicing operations:

Extract the first row of the array.

Extract the last column of the array.

Extract a 2x2 sub-array from the center of the original array.

```
import numpy as np
```

```
# Initialize a 3x3 NumPy array with integer values
array = np.array([[1, 2, 3], [4, 5, 6], [7, 8, 9]])
```

```
# Extract the first row of the array
first_row = array[0, :]
```

```
# Extract the last column of the array
last_column = array[:, -1]
```

```
# Extract a 2x2 sub-array from the center of the original array
sub_array = array[1:3, 1:3]
```

```
# Print the results
print("Original array:")
print(array)
print("\nFirst row:")
print(first_row)
print("\nLast column:")
print(last_column)
print("\n2x2 sub-array from the center:")
print(sub_array)
```

```
.. Original array:
   [[1 2 3]
    [4 5 6]
    [7 8 9]]

   First row:
   [1 2 3]

   Last column:
   [3 6 9]

   2x2 sub-array from the center:
   [[5 6]
    [8 9]]
```

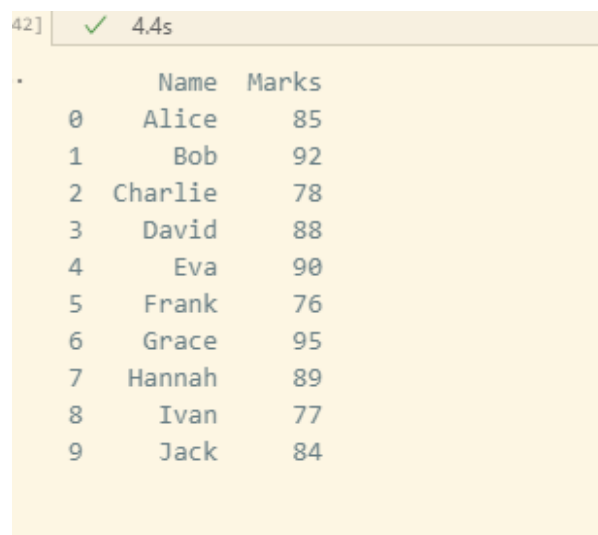
Q3) Write a program to create a DataFrame in Python to store the names and marks of 10 students. Each row of the DataFrame should represent a student, with columns as 'Name' and 'Marks'. Populate the DataFrame with appropriate data and then print it.

```
import pandas as pd

# Create a dictionary with student names and marks
data = {
    'Name': ['Alice', 'Bob', 'Charlie', 'David', 'Eva', 'Frank', 'Grace', 'Hannah', 'Ivan', 'Jack'],
    'Marks': [85, 92, 78, 88, 90, 76, 95, 89, 77, 84]
}

# Create a DataFrame
df = pd.DataFrame(data)

# Print the DataFrame
print(df)
```



	Name	Marks
0	Alice	85
1	Bob	92
2	Charlie	78
3	David	88
4	Eva	90
5	Frank	76
6	Grace	95
7	Hannah	89
8	Ivan	77
9	Jack	84

Q4) Write a python program to create a DataFrame representing the names and income of 5 employees. The DataFrame should include columns 'Employee_name' and 'Income', and each row should correspond to an individual employee. Use the indices 'a', 'b', 'c', 'd', and 'e' for the DataFrame entries to uniquely identify each employee.

```
import pandas as pd

# Create a dictionary with employee names and income
data = {
    'Employee_name': ['John', 'Jane', 'Jim', 'Jill', 'Jack'],
    'Income': [50000, 60000, 55000, 65000, 70000]
}

# Create a DataFrame with custom indices
df = pd.DataFrame(data, index=['a', 'b', 'c', 'd', 'e'])

# Print the DataFrame
print(df)
```

```
...      Employee_name  Income
a           John    50000
b           Jane    60000
c            Jim    55000
d           Jill    65000
e           Jack    70000
```

Q5) Imagine you're tasked with visualizing data using Python. You have the following dataset representing the frequency of occurrences for categories A, B, C, D, and E, stored in two lists:

```
x = ['A', 'B', 'C', 'D', 'E']
```

```
y = [10, 20, 15, 25, 30]
```

Write a Python script that creates a bar plot to visualize this data. The categories A, B, C, D, and E should be displayed on the x-axis, while the corresponding frequencies should be displayed on the y-axis.

```
import matplotlib.pyplot as plt
```

```
# Data for the plot
```

```
x = ['A', 'B', 'C', 'D', 'E']
```

```
y = [10, 20, 15, 25, 30]
```

```
# Create a bar plot
```

```
plt.bar(x, y)
```

```
# Add title and labels
```

```
plt.title('Frequency of Occurrences for Categories')
```

```
plt.xlabel('Categories')
```

```
plt.ylabel('Frequency')
```

```
# Show the plot
```

```
plt.show()
```

