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الجامعة اللبنانية
كلية الاعلام
الفرع الاول

الأولى/الفصل الأول امتحانات الدورة

من العام 2024/2023

	Course Name: Programming for Data Science
Academic Year: 2nd Year	Duration: 2 Hours
Major: Data Science	Instructor Name: Moustafa Kchour

Question 1: Choose the correct answer

1. Which of the following statements is correct for array slicing in NumPy?

   a. Slicing creates a copy of the original array.

   b. Slicing returns a view on the original array.

   c. Slicing can only be performed on one-dimensional arrays.

   d. Slicing always produces a one-dimensional array.

2. What is the correct method for horizontally stacking two NumPy arrays?

   a. np.merge

   b. np.hstack

   c. np.concat_horizontal

   d. np.join

3. Which NumPy function is used to find the indices of elements that satisfy a given condition in an array?

   a. np.where

   b. np.search

   c. np.find

   d. np.locate

4. What is the primary difference between np.copy() and array assignment (arr1 = arr2) in NumPy?

   a. np.copy() creates a shallow copy, while array assignment creates a deep copy.

   b. np.copy() creates a deep copy, while array assignment creates a shallow copy.

   c. Both np.copy() and array assignment create shallow copies.

   d. Both np.copy() and array assignment create deep copies.

5. Which NumPy function is used to filter elements from an array based on a specified condition?

   a. np.filter

   b. np.extract

   c. np.select

   d. np.screen

Question 2: Could you please provide the output for the following three code snippets?

Code 1:

```
import numpy as np
arr = np.array([[1, 2, 3], [4, 5, 6]])
for x in arr:
  for y in x:
    print(y)
```

Code 2:

```
import numpy as np
arr = np.array([[3, 2, 4], [5, 0, 1]])
print(np.sort(arr))
```

Code 3:

```
# Base class
class Person:
    def __init__(self, name, age):
        self.name = name
```

```
    self.age = age

def introduce(self):
    print(f"Hi, I'm {self.name}, and I'm {self.age} years old.")

# Derived class inheriting from Person
class Employee(Person):
    def __init__(self, name, age, employee_id):
        # Call the constructor of the base class
        super().__init__(name, age)
        self.employee_id = employee_id

    def display_info(self):
        # Reuse the introduce method from the base class
        self.introduce()
        print(f"I am an employee with ID {self.employee_id}.")

# Create an instance of the derived class
employee1 = Employee("Alice", 30, "EMP001")

# Call methods from both base and derived classes
employee1.display_info()
```

Question 3:

Consider two lists, list1 and list2, containing numerical data. Implement a NumPy solution to perform the following tasks:

Create NumPy arrays arr1 and arr2 from list1 and list2, respectively.

Calculate the element-wise sum of arr1 and arr2 using the function np.add() and store the result in a new NumPy array called result_sum..

Find the maximum value in result_sum.

Reshape arr2 into a 2x3 NumPy array.

Provide the Python code to achieve these tasks using NumPy.

Sample Lists:

list1 = [1, 2, 3, 4, 5]

list2 = [5, 4, 3, 2, 1]

Question 4:

Generate a sample of 1000 data points from a normal distribution with a mean of 50 and a standard deviation of 10.

Utilize Seaborn's distplot function to create a visualization that includes both a histogram and a kernel density estimate (KDE) for the generated data.

Provide the Python code to accomplish this task. Ensure you set the appropriate parameter to include the kernel density estimate in the plot.

Question 5:

Implement a basic calculator using Python classes. The calculator should support addition, subtraction, multiplication, and division operations. Design a class named Calculator with the following methods:

__init__(self): Initialize the calculator.

add(self, num1, num2): Accepts two numbers (num1 and num2) and returns their sum.

subtract(self, num1, num2): Accepts two numbers (num1 and num2) and returns the result of subtracting num2 from num1.

multiply(self, num1, num2): Accepts two numbers (num1 and num2) and returns their product.

divide(self, num1, num2): Accepts two numbers (num1 and num2) and returns the result of dividing num1 by num2. Ensure to handle division by zero by returning an appropriate message.

Write a Python code snippet that demonstrates the usage of the Calculator class by performing operations with sample numbers.