

Homework Assignment: Advanced Operations on Lists, Tuples, Dictionaries, and Sets

Objective: The primary objective of this assignment is to deepen students' understanding of Lists, Tuples, Dictionaries, and Sets by covering advanced methods, properties, manipulation, and indexing.

Instructions:

Problem 1: Advanced List Operations

1. Write a Python script that initializes a list of integers. Implement the following operations:
 - Use the ``map()`` function to square each element in the list.
 - Use list comprehension to create a new list containing only the even numbers from the original list.
2. Extend the script to:
 - Use the ``sorted()`` function to sort the list in descending order.
 - Remove duplicates from the list without changing the order.

Problem 2: Exploring Tuple Properties

3. Create a tuple that represents the RGB values of a color (e.g., ``(255, 0, 0)`` for red). Write a function that takes a tuple as an argument and prints its length, sum of values, and average.
4. Implement a program that converts the RGB tuple into a hexadecimal color code. Print the resulting color code.

Problem 3: Dictionary Manipulation

5. Write a Python script that initializes a dictionary representing the population of cities. Implement the following operations:
 - Add a new city and its population to the dictionary.
 - Remove a city from the dictionary.
 - Update the population of a specific city.
6. Use a dictionary comprehension to create a new dictionary containing only cities with a population greater than 1 million.

Problem 4: Set Indexing and Properties

7. Create two sets with random values. Implement the following operations:
 - Check if one set is a subset of the other.
 - Find the union of the two sets.
 - Calculate the intersection of the sets.

- Determine the difference between the sets.

8. Write a program that utilizes a set to remove duplicate elements from a list of strings. Print both the original list and the list after removing duplicates.

Additional Tips:

- Utilize online resources, Python documentation, and course materials to reinforce your understanding.
- Collaborate with classmates to discuss concepts and problem-solving.
- Seek assistance from your instructor or classmates if you encounter difficulties.