

CS5001 HW3

Instructions

- Write your name as well as your NU ID on your assignment. Please number your problems.
- Submit both results and your code.
- Give complete answers. Do not just give the final answer; instead, show steps you went through to get there and explain what you are doing. Do not leave out critical intermediate steps.
- This assignment must be submitted electronically through Gradescope by October 8th, 2024 (Tuesday) by 9:00 AM.
- All of your codes must be commented.

5 pt each

15 pts total

Written Questions

1. Explain the difference between a set and a dictionary in Python.
2. How do you initialize a dictionary? How do you initialize a set? How do you initialize a list? Pair with examples please.
3. Can you create a dictionary whose keys are strings, values are dictionaries?

Coding Questions

5pts on each function

1. Manage the inventory

25 pts total

Write a Python program to manage an inventory system for a store. Each item in the inventory should have a name (string) and a list of quantities in stock at different warehouse locations (list of integers). Use a dictionary to store each item, where the key is the item name, and the value is the list of quantities from various warehouses.

Implement the following functionalities:

- Add a new item with its name and at least one quantity for a warehouse.
- Update an existing item by adding a new warehouse's quantity to the list.
- Remove an item by its name from the inventory.
- Display the quantities of an item by its name.
- Display all items in the inventory along with their quantities.

2. Husky Card Management System

Write a Python program to manage a Husky card management system. Each student should have a name (string) and a list of subjects they are enrolled in (list of strings). Use a dictionary to store each student, where the key is the student's name, and the value is the list of subjects they are enrolled in.

Implement the following functionalities:

- Add a new student with their name and at least one subject. If the student already exists, print a message indicating so and do not add them again.
- Modify the subjects of an existing student by replacing an old subject with a new one.
- Remove a specific subject from a student's list. If the subject does not exist, display an appropriate message.
- Display all students currently enrolled in a specific subject.
- List all students along with their subjects in alphabetical order by student name.

5pts on each function
25 pts total

3. Nested List: Matrix Manipulation (2x2)

35pts

In this assignment, you will work with a 2x2 matrix, which is represented as a nested list in Python. Each element of the matrix is an integer. Your task is to implement basic matrix operations manually, without using loops.

Write a Python program that implements the following functionalities:

5pts

- **Create a matrix:** Define a function to create a 2x2 matrix initialized to zero. The matrix should be represented as a nested list.

5pts

- **Update an element:** Define a function that updates the value of a specific element in the matrix by specifying the row, column, and new value.

5pts

- **Display the matrix:** Define a function that prints the matrix in a 2x2 format. The matrix should be displayed without using loops.

10pts

- **Transpose the matrix:** Define a function to transpose the matrix (swap rows and columns) and return the transposed matrix.

5pts

- **Sum of all elements:** Define a function that calculates and returns the sum of all elements in the matrix.

5pts

- **Multiply by a scalar:** Define a function to multiply each element of the matrix by a scalar (a number) and update the matrix with the result.

You are not allowed to use any loops (e.g., **for** or **while**) in your solution. All operations should be performed manually by accessing specific elements of the matrix.

Example:

Initial Matrix:

```
[0, 0]
[0, 0]
```

Matrix after updates:

```
[5, 0]
[0, 3]
```

Transpose of the matrix:

```
[5, 0]
[0, 3]
```

Sum of all elements: 8

Matrix after multiplying by 2:

```
[10, 0]
[0, 6]
```

Hint: Use list indexing to manually access and modify individual elements in the matrix.