Assignment 2

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Implement all the functions of a dictionary (ADT) using hashing and handle collisions using chaining with / without replacement. Data: Set of (key, value) pairs, Keys are mapped to values, Keys must be comparable, Keys must be unique. Standard Operations: Insert(key, value), Find(key), Delete(key)

```
class Node:
    def __init__(self, key, value):
        self.key = key
        self.value = value
        self.next = None


class HashTable:
    def __init__(self, size=10):
        self.size = size
        self.table = [None] * self.size


    def _hash(self, key):
        # Simple hash function using the built-in Python hash and modulo operator
        return hash(key) % self.size


    def insert(self, key, value):
        index = self._hash(key)
        new_node = Node(key, value)
        # If there is no chain at the index, add the new node directly
        if self.table[index] is None:
            self.table[index] = new_node
        else:
            # If collision occurs, handle using chaining (without replacement)
            current = self.table[index]
            while current:
                if current.key == key:
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                # If key already exists, update value (with replacement)
                current.value = value
                return
            if current.next is None:
                break
            current = current.next
        # If not found, append to the end of the chain
        current.next = new_node

def find(self, key):
    index = self._hash(key)
    current = self.table[index]
    while current:
        if current.key == key:
            return current.value
        current = current.next
    return None  # Key not found

def delete(self, key):
    index = self._hash(key)
    current = self.table[index]
    prev = None
    while current:
        if current.key == key:
            if prev is None:  # Deleting the first node in the chain
                self.table[index] = current.next
            else:
                prev.next = current.next
            return True
            prev = current
            current = current.next
        return False  # Key not found

    def display(self):
        for i in range(self.size):
            print(f"Index {i}: ", end="")
            current = self.table[i]
            if current is None:
                print("Empty")
            else:
                while current:
                    print(f"({current.key}: {current.value})", end=" -> ")
                    current = current.next
                print()

# Main program to interact with the user
def main():
    hash_table = HashTable()
    while True:
        print("\nDictionary Operations:")
        print("1. Insert (key, value)")
        print("2. Find (key)")
        print("3. Delete (key)")
        print("4. Display")
        print("5. Exit")
        choice = int(input("Enter your choice: "))

        if choice == 1:
```
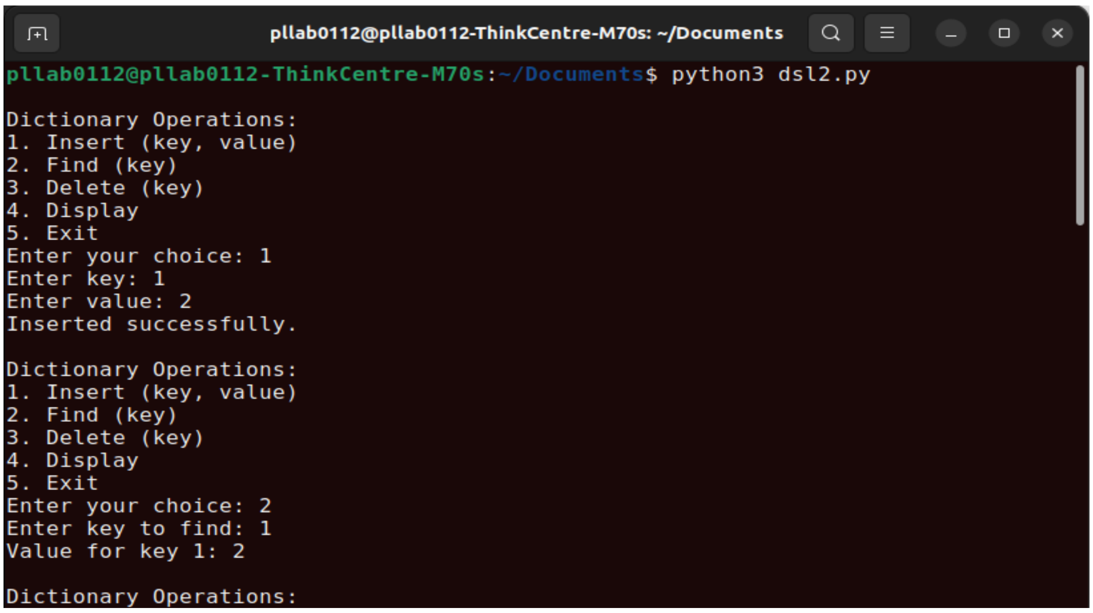
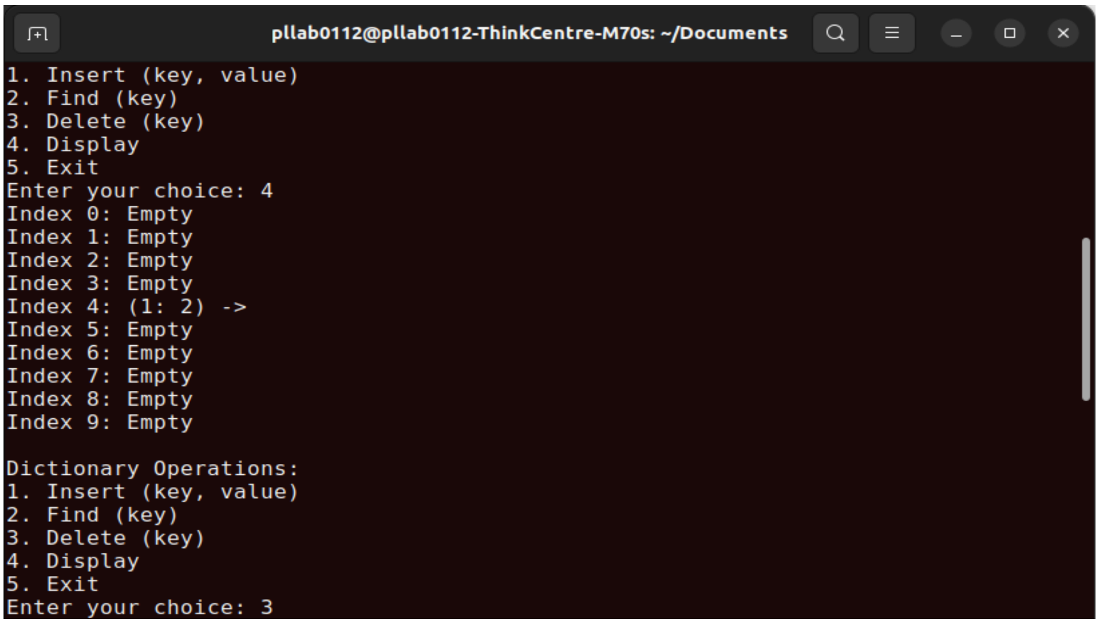

```
    key = input("Enter key: ")
    value = input("Enter value: ")
    hash_table.insert(key, value)
    print("Inserted successfully.")

  elif choice == 2:
    key = input("Enter key to find: ")
    result = hash_table.find(key)
    if result is None:
      print("Key not found.")
    else:
      print(f"Value for key {key}: {result}")

  elif choice == 3:
    key = input("Enter key to delete: ")
    if hash_table.delete(key):
      print(f"Key {key} deleted successfully.")
    else:
      print(f"Key {key} not found.")

  elif choice == 4:
    hash_table.display()

  elif choice == 5:
    print("Exiting...")
    break
  else:
    print("Invalid choice. Please try again.")
```

```
if __name__ == "__main__":
    main()
```

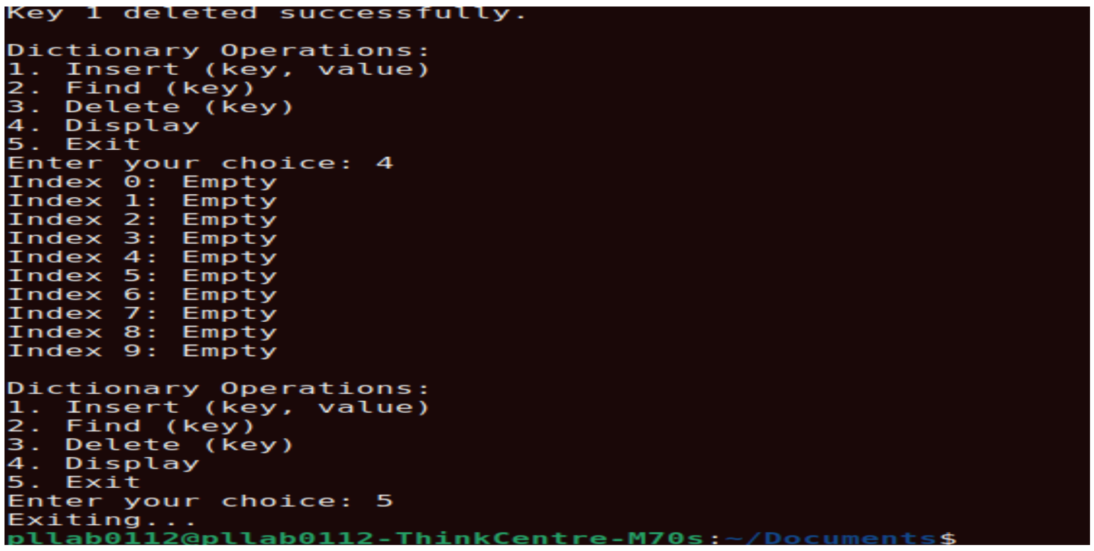
// OUTPUT



```
pllab0112@pllab0112-ThinkCentre-M70s:~/Documents$ python3 dsl2.py

Dictionary Operations:
1. Insert (key, value)
2. Find (key)
3. Delete (key)
4. Display
5. Exit
Enter your choice: 1
Enter key: 1
Enter value: 2
Inserted successfully.

Dictionary Operations:
1. Insert (key, value)
2. Find (key)
3. Delete (key)
4. Display
5. Exit
Enter your choice: 2
Enter key to find: 1
Value for key 1: 2

Dictionary Operations:
```



```
1. Insert (key, value)
2. Find (key)
3. Delete (key)
4. Display
5. Exit
Enter your choice: 4
Index 0: Empty
Index 1: Empty
Index 2: Empty
Index 3: Empty
Index 4: (1: 2) ->
Index 5: Empty
Index 6: Empty
Index 7: Empty
Index 8: Empty
Index 9: Empty

Dictionary Operations:
1. Insert (key, value)
2. Find (key)
3. Delete (key)
4. Display
5. Exit
Enter your choice: 3
```



```
Key 1 deleted successfully.

Dictionary Operations:
1. Insert (key, value)
2. Find (key)
3. Delete (key)
4. Display
5. Exit
Enter your choice: 4
Index 0: Empty
Index 1: Empty
Index 2: Empty
Index 3: Empty
Index 4: Empty
Index 5: Empty
Index 6: Empty
Index 7: Empty
Index 8: Empty
Index 9: Empty

Dictionary Operations:
1. Insert (key, value)
2. Find (key)
3. Delete (key)
4. Display
5. Exit
Enter your choice: 5
Exiting...
pllab0112@pllab0112-ThinkCentre-M70s:~/Documents$
```