Tuples and Sets

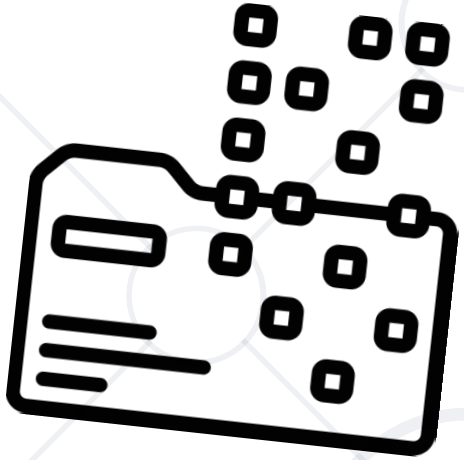

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Table of Contents

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Tuples

Read-Only Collection

Definition

- **Tuples** are part of the standard language
- Tuples are **immutable* objects**
  - *but the **objects**, inside the tuples, **are mutable**
- Tuples are sequences, just like lists
- Tuples **cannot be changed** unlike lists
- Tuples use **parentheses**, whereas lists use square brackets

Creating a Tuple

- To create a tuple, place values within brackets

```
t = (1, 2, 3)
print(t[0]) # 1
```

- You can also use commas

```
t = 1, 2, 3
print(t) # (1, 2, 3)
```

- Creating tuple with a single element

```
t = (1, )
```

Methods

- There are only **two** available tuple methods:
  - `count` – returns the number of times a specified value occurs

```
numbers = (1, 2, 1, 3, 1)
numbers.count(1) # 3
```

  - `index` - returns the index of a particular element

```
names = ("Pesho", "Gosho", "Gosho")
names.index("Gosho") # 1
```

Tuple Unpacking

- **Tuple unpacking** allows to extract tuple elements and assign them to elements

```
data = (1, 2, 3)
x, y, z = data
print(x) # 1
print(y) # 2
print(z) # 3
```

The number of elements on the left = length of the tuple

Problem: Count Same Values

- You will be given numbers separated by a space
- Count the **occurrences** of each value and print it
- Try using the dictionary method `.items()` to iterate over each of them

```
-2.5 4 3 -2.5 -5.5 4 3 3 -2.5 3
```

```
-2.5 - 3 times
4.0 - 2 times
3.0 - 4 times
-5.5 - 1 times
```

Solution: Count Same Values

```
numbers = tuple(map(float, input().split()))

nums_and_occurances = {}
for num in numbers:
    if num not in nums_and_occurances:
        nums_and_occurances[num] = 0
    nums_and_occurances[num] += 1

[print(f"{key} - {value} times") for key, value in
nums_and_occurances.items()]
```

Problem: Students' Grades

- You will receive a number (count of input lines: n)
- On the next n-lines you will be given "{name} {grade}"
- For each student print all his/her **grades** and finally his/her **average grade**, formatted to the second decimal point

```
4
Vladimir 4.50
Petko 3.00
Vladimir 5.00
Petko 3.66
```

```
Vladimir -> 4.50 5.00 (avg: 4.75)
Petko -> 3.00 3.66 (avg: 3.33)
```

Solution: Students' Grades

```
count = int(input())
students = {}
for _ in range(count):
    line = tuple(input().split())
    student, grade = line
    if student not in students:
        students[student] = []
    students[student].append(float(grade))

# Print the result
```

Sets

Unique Sequence

Definition

- Set is an **unordered collection** of items
- Every element of a set is **unique**
- Sets are **mutable**, so we can add or remove items from it
- Sets can be used to perform mathematical **set operations** (union, intersection, symmetric difference, etc.)

Operators

```
a = set([1, 2, 3, 4])
b = set([3, 4, 5, 6])
a | b # Union -> {1, 2, 3, 4, 5, 6}
a & b # Intersection -> {3, 4}
a < b # Subset -> False
a > b # Superset -> False
a - b # Difference -> {1, 2}
a ^ b # Symmetric Difference -> {1, 2, 5, 6}
```

You can also use methods instead of symbols

Methods

- Each operator is associated to a symbol and a method name

```
a = set([1, 2, 3, 4])
b = set([3, 4, 5, 6])
a.union(b)                  # Equivalent to a | b
a.intersection(b)           # Equivalent to a & b
a.issubset(b)               # Equivalent to a <= b
a.issuperset(b)             # Equivalent to a >= b
a.difference(b)             # Equivalent to a - b
a.symmetric_difference(b)   # Equivalent to a ^ b
```

Set Comprehension

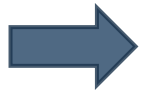
- Set comprehensions are pretty similar to list comprehensions
- The only difference is that set comprehensions use curly brackets { }

```
nums = [1, 2, 3, 4, 4, 5, 6, 2, 1]
unique = {num for num in nums}
# {1, 2, 3, 4, 5, 6}
```

Problem: Record Unique Names

- You will be given a list and you should print unique items
  - The order does **not** matter

```
7
Lyle
Bruce
Alice
Easton
Shawn
Alice
Shawn
```



```
Lyle
Bruce
Alice
Easton
Shawn
```

Solution: Record Unique Names

```
n = int(input())
unique_names = set()
for i in range(n):
    unique_names.add(input())
for person in unique_names:
    print(person)
```

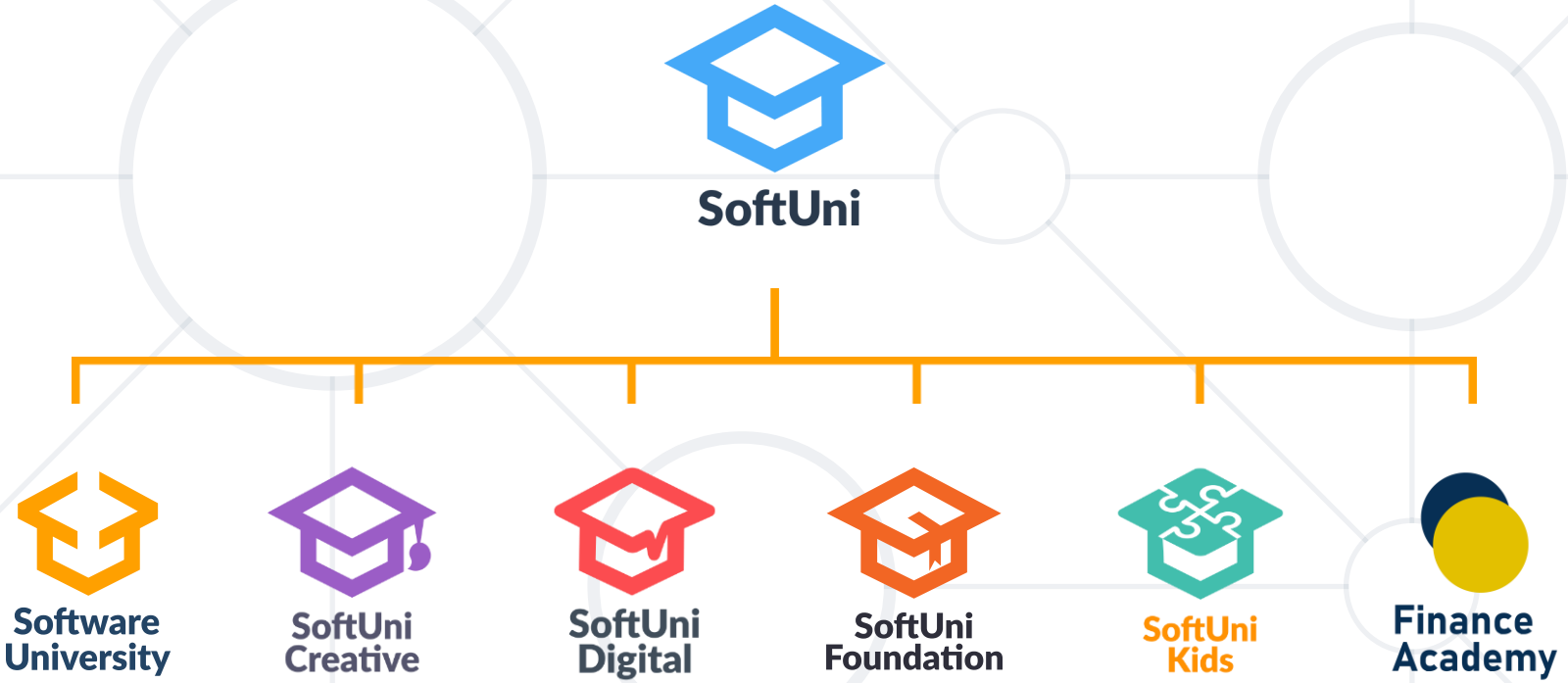
Practice

Live Exercise in Class (Lab)

Summary

- Tuples are **immutable**
- Tuples can hold **nonunique** elements
- Tuples are **ordered** collections
- Sets are **mutable**
- Sets hold **unique** elements
- Sets are **unordered** collections

Questions?



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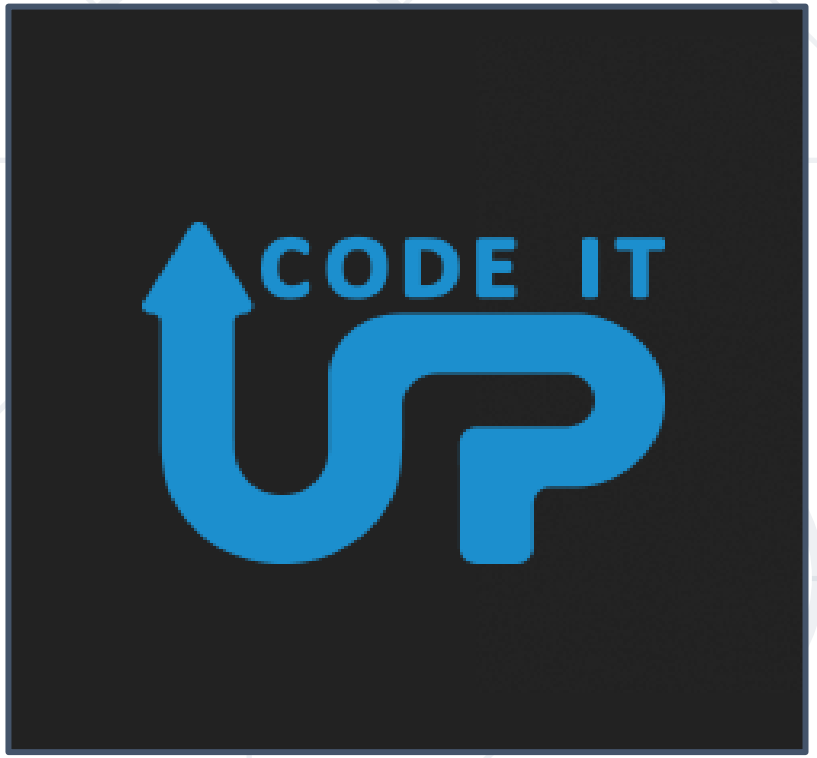

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