KOLT Python

Containers, Aliasing & Mutability

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KOÇ UNIVERSITY
OFFICE OF LEARNING AND TEACHING

Agenda

Functions

Lists

1. Data Model

2. Aliasing & Cloning

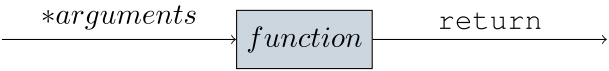
3. Mutability

4. Tuples

5. Sets

6. Dictionaries

Functions



Functions

$$\xrightarrow{\quad *arguments \quad} \boxed{function} \xrightarrow{\quad \texttt{return} \quad}$$

```
def function_name(parameter2, parameter2, ...):
    <expression>
    ...
    return value
```

Functions

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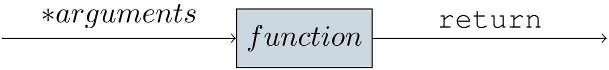
```
fib_100 = fibonacci_series(100)
```

Functions




```
def function_name(parameter2, parameter2, ...):
    <expression>
    ...
    return value
```

```
fib_100 = fibonacci_series(100)
what_is_going_on = print(fib_100)
```

return Statement

Every function returns one value!

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What type does each function return?

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```
def square(x):
    return x**2
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```
def your_full_name(name, surname):
    return name + ' ' + surname
```

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What type does each function return?

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def square(x):
    return x**2
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def your_full_name(name, surname):
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```
def what_is_the_meaning_of_life(life):
    print("I guess it's nothing")
```

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def your_full_name(name, surname):
    return name + ' ' + surname
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def what_is_the_meaning_of_life(life):
    print("I guess it's nothing")
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```
def who_are_my_instructors(student):
    instructors = ['Ahmet', 'Ceren', 'Gül Sena', 'Hasan Can']
    return instructors
```

Sponge Bob seeks for Sandy

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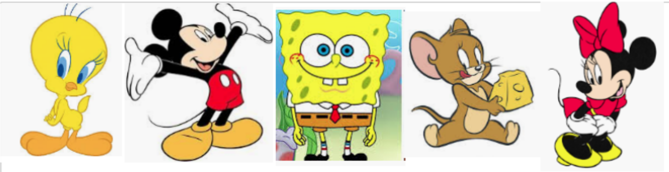
```
cartoon_characters=['Tweety', 'Mickey', 'Sponge Bob', 'Jerry',
'Minnie']
```



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cartoon_characters=['Tweety', 'Mickey', 'Sponge Bob', 'Jerry',
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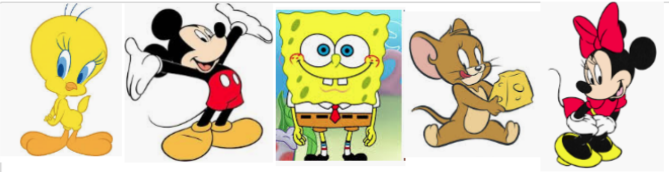

```
cartoon_characters.append('Sandy')
```

Sponge Bob seeks for Sandy

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cartoon_characters=['Tweety', 'Mickey', 'Sponge Bob', 'Jerry',
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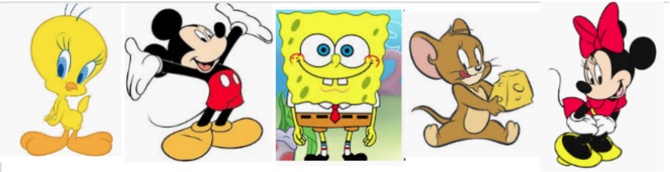

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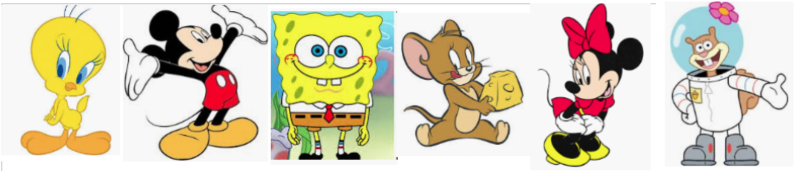

Let's play

But, what good is Mickey without being near to Minnie?

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cartoon_characters.remove('Mickey')
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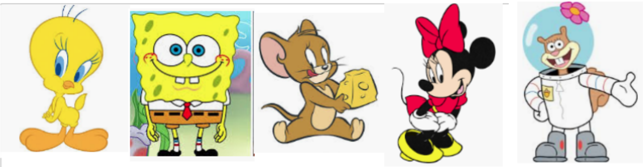

0	1	2	3	4

Let's play

But, what good is Mickey without being near to Minnie?

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cartoon_characters.remove('Mickey')
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```
cartoon_characters.insert(4, 'Mickey')
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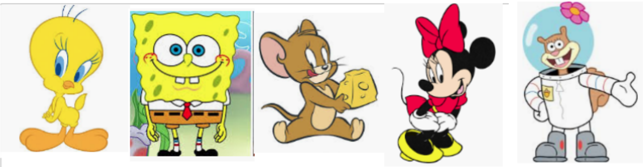

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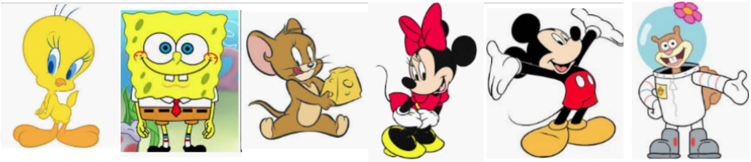
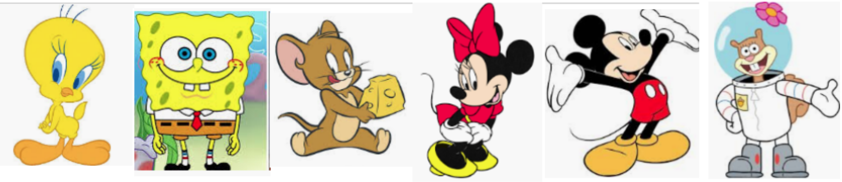


List Operations

Be quick!



`len(cartoon_characters)` ⇒

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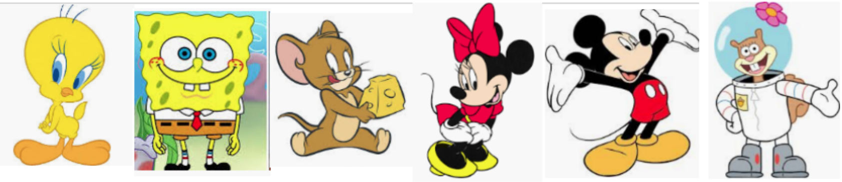

`len(cartoon_characters)` ⇒ 6

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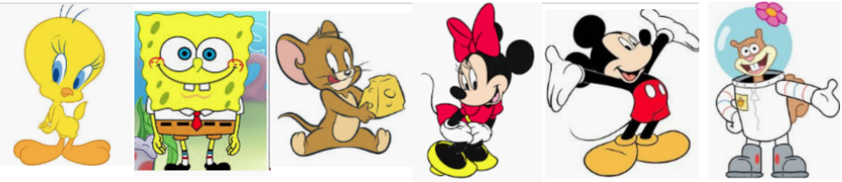

```
len(cartoon_characters) ⇒ 6
cartoon_characters[6] ⇒
```

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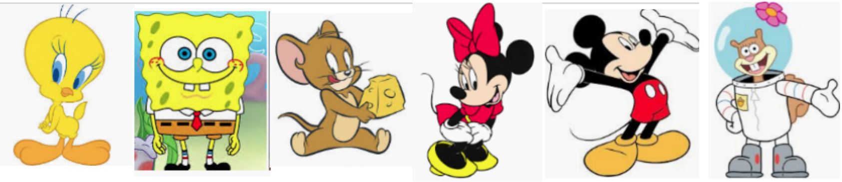

`len(cartoon_characters)` ⇒ 6
`cartoon_characters[6]` ⇒ Error

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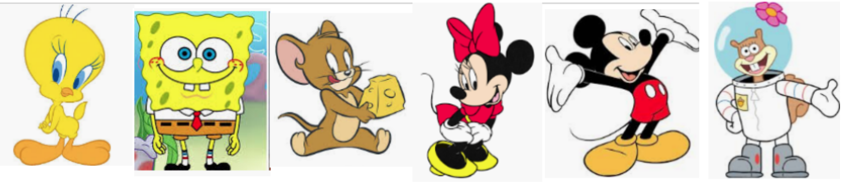

`len(cartoon_characters)` ⇒ 6

`cartoon_characters[6]` ⇒ Error

`'Jerry'in cartoon_characters` ⇒

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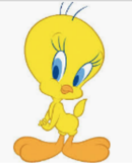




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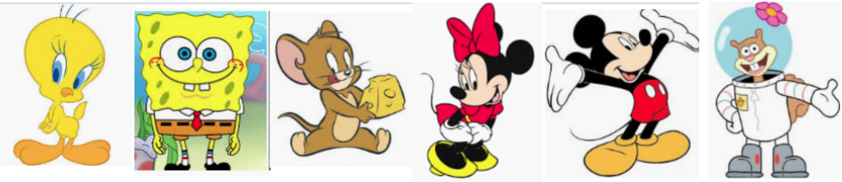

`len(cartoon_characters)` ⇒ 6
`cartoon_characters[6]` ⇒ Error
`'Jerry'in cartoon_characters` ⇒ `True`
`cartoon_characters.index('Tweety')` ⇒

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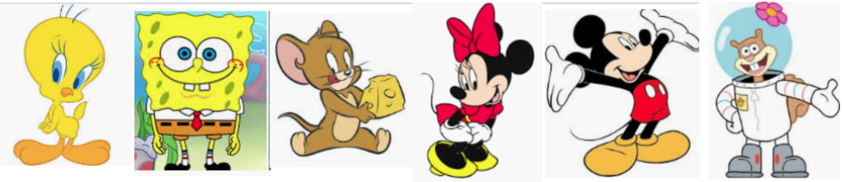

`len(cartoon_characters)` ⇒ 6

`cartoon_characters[6]` ⇒ Error

`'Jerry'in cartoon_characters` ⇒ `True`

`cartoon_characters.index('Tweety')` ⇒ 0

Python Data Model

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How did we represent data in Python?

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How do they work?

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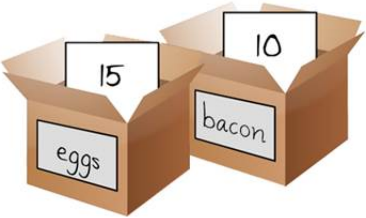

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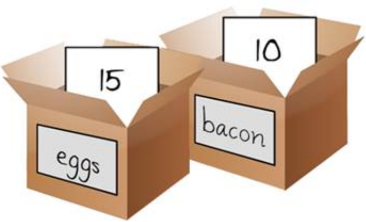

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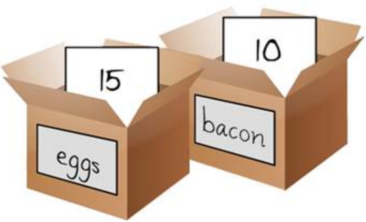

NO! Variables point to Python objects

Python Data Model

```
my_secret_box = [0, 1, 2]
```

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my_secret_box = [0, 1, 2]
```

0	1	2

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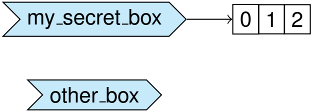

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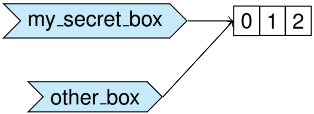
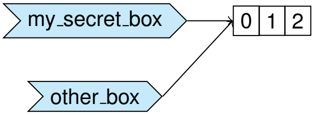


Python Data Model

```
my_secret_box = [0, 1, 2]
other_box = my_secret_box
other_box.remove(2)
```



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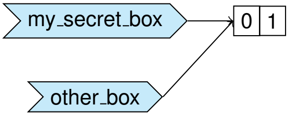

Python Data Model

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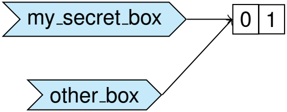
other_box.remove(2)
print(my_secret_box)
```



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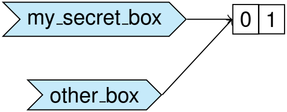

Variables are more like **labels** pointing to **values**!

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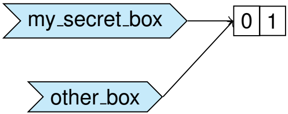
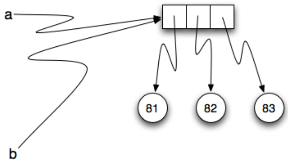


Variables are more like **labels** pointing to **values**!
Assignment links **variables** to **values**!

Aliasing & Cloning

- More than one variables can refer to **same object**!
- This is known as **aliasing**, i.e, having more than one name.
- What if we want to clone/copy instead of aliasing?
- For lists, `list.copy()` ⇒ returns a shallow copy of the list.
- Shallow: only copy the references, not inner values.



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```

Cloning

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my_secret_box = [0, 1, 2]
other_box =
my_secret_box.clone()
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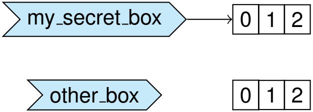

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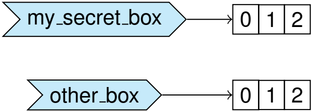

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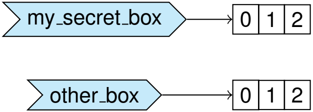

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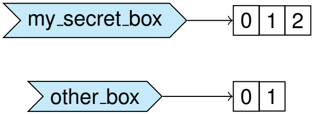

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print(my_secret_box)
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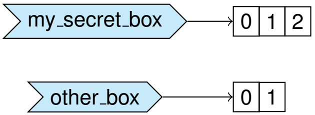

Mutability

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An `object` with a fixed value.

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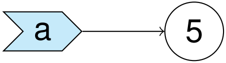

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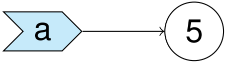

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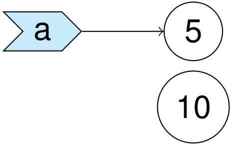

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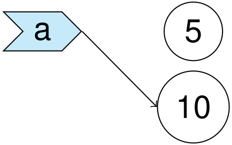

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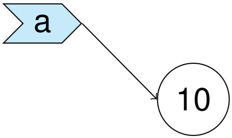

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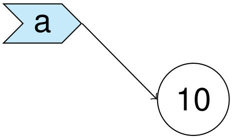

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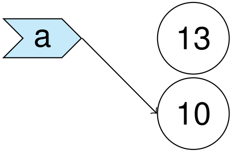

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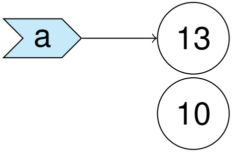

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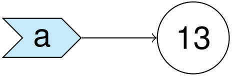


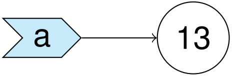
Mutability

Immutable:

An `object` with a fixed value.

- **numbers**, **strings**, **tuples**, . . .
- Such an object cannot be altered
- A new object has to be created if a different value has to be stored

```
a = 5
a = 10
a += 3
print(a)
```



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```
my_list = [1, 2, 3]
my_tuple = ('a', my_list) # ('a', [1, 2, 3, 4])
my_list.append(4)
print(my_tuple)
my_list += [5, 6, 7]  # my_list.extend(...)
print(my_tuple)
my_tuple += (1, 2)# my_tuple = my_tuple + (1, 2)
print(my_tuple)
```

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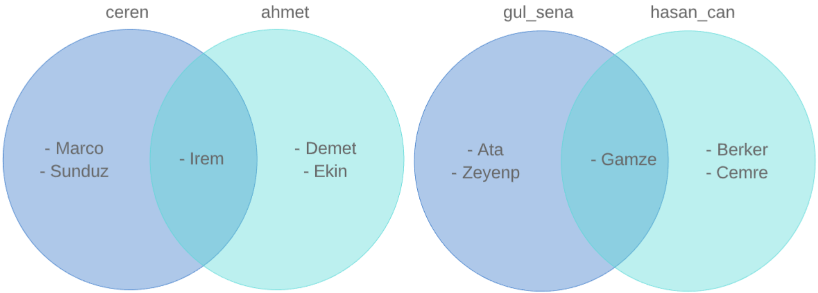
- Can compute set operations: **union**, **intersection**, **difference**, **symmetric difference**.

Sets


ceren
ahmet
- Marco
- Sunduz
- Irem
- Demet
- Ekin
gul_sena
hasan_can
- Ata
- Zeyenp
- Gamze
- Berker
- Cemre

Sets

```
ceren = {'Marco', 'Irem', 'Sunduz'}
gul_sena = {'Gamze', 'Ata', 'Zeynep'}
hasan_can = {'Gamze', 'Berker', 'Cemre'}
ahmet = {'Irem', 'Demet', 'Ekin'}

# intersection &
print(gul_sena.intersection(hasan_can))  # => {'Gamze'}
print(ceren & gul_sena)  # => set()
# union |
print(ceren.union(ahmet))  # => {'Ekin', 'Irem', 'Demet',
                           # 'Marco', 'Sunduz'}
print(hasan_can | ceren | gul_sena | ahmet)  # => all names
# difference -
print((gul_sena - hasan_can))  # => {'Zeynep', 'Ata'}
# symmetric_difference ^
print(ceren.symmetric_difference(ahmet))
# => {'Marco', 'Ekin', 'Sunduz', 'Demet'}}
```

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- `d = {'one': 1, 'two': 2, 'three': 3, 'four': 4}`
- How to access values? `print(d['one'])` # ⇒ 1

Confused Section Leader Gul Sena

```python
# I need a way to keep track of my students
my_students = {'Ayse': ['economics', 'freshman'],
               'Emir': ['psychology', 'master'],
               'Emirhan': ['business administration', 'junior'],
               'Furkan': ['law', 'junior'],
               'Mahsa': ['material science', 'phd'],
               'Meva': ['international relations', 'freshman']}

for student, info in my_students.items():
    print(f'{student} studies {info[0]}')
# Emir left my class :(
my_students.pop('Emir')
# someone new in my class
my_students['Canan'] = ['industrial engineering', 'junior']
# Ayse passed another year
my_students['Ayse'][1] = 'sophomore'
```

Announcements

Fill out the attendance form:
tiny.cc/koltpython
Keyword: **ceren**

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Assignment I: Tic-Tac-Toe is due tonight!