KOLT Python

Error Handling, File Input & Output

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Monday 11th November, 2019

KOLT

Agenda

1. Recap
2. Sets
3. Dictionaries
4. File Input/Output
5. Error/Exception Handling
6. Debugging

Mutability

Immutable:

An `object` with a fixed value. Immutable objects include **numbers**, **strings** and **tuples**. Such an object cannot be altered. A new object has to be created if a different value has to be stored. They play an important role in places where a constant **hash value** is needed, for example as a **key** in a `dictionary`.

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a += 3
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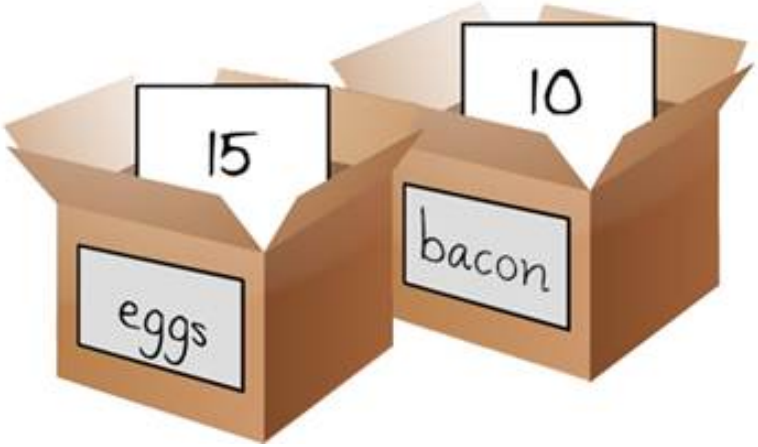
Python Data Model

How did we represent data in Python? **Variables!**
How do they work? Do they store the data themselves?



Box Analogy

```
my_fav_number = 13
other_number = my_fav_number
other_number += 3
print(my_fav_number)   # => 13
```

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

Did we just changed inside of a closed box? Box analogy **does not** work!

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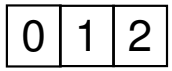

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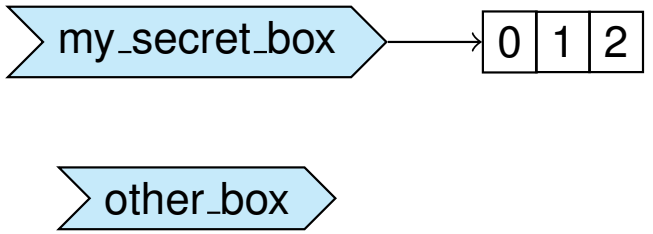

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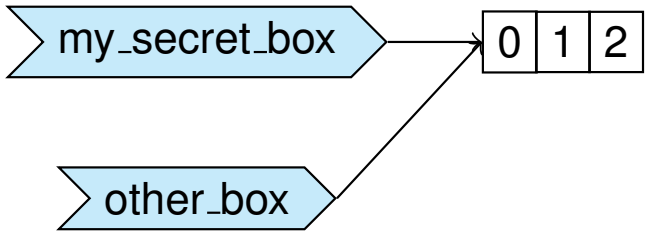

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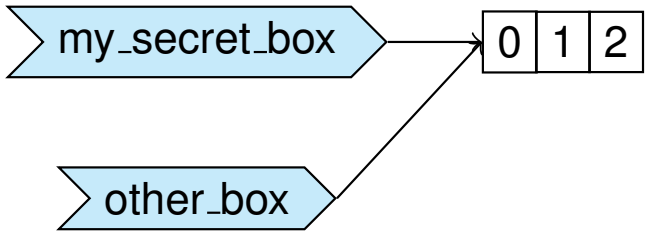

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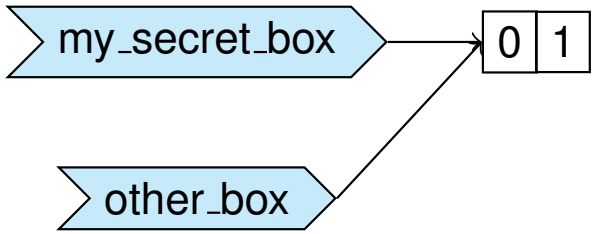

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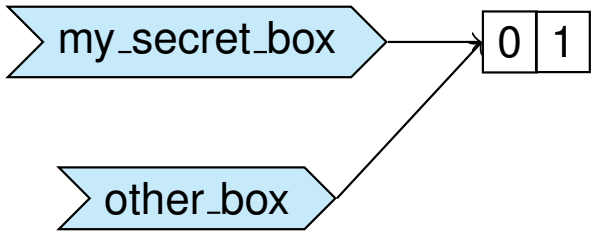

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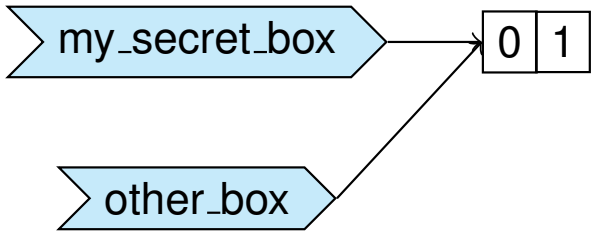

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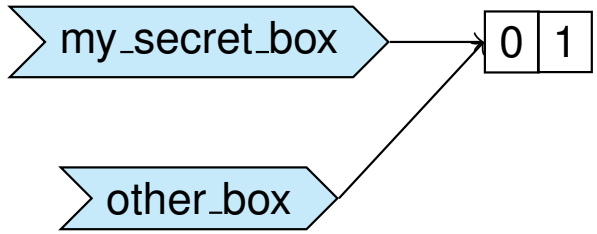

Variables are more like **labels** pointing to **values**!
Assignment links **variables** to **values**!

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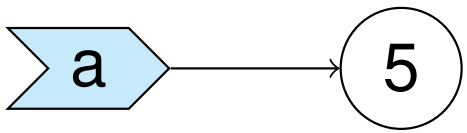

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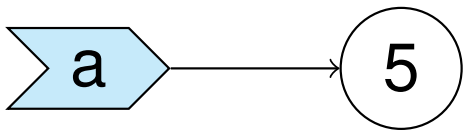

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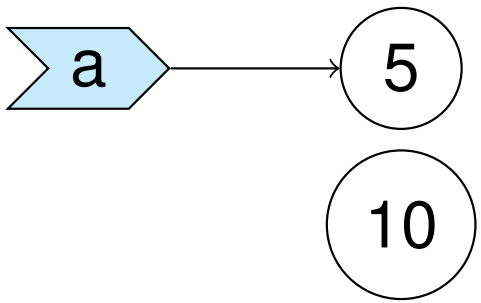

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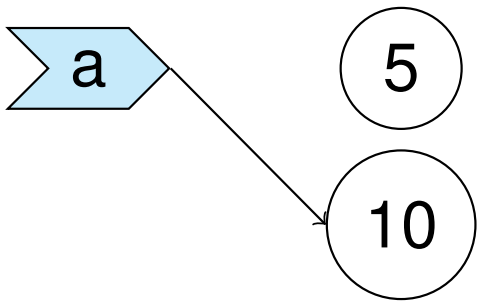

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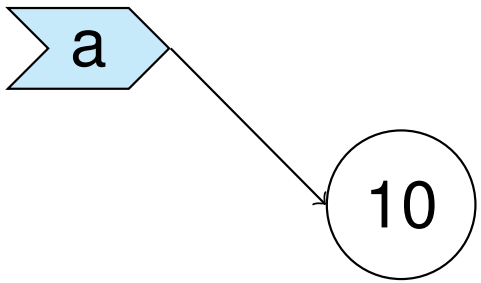

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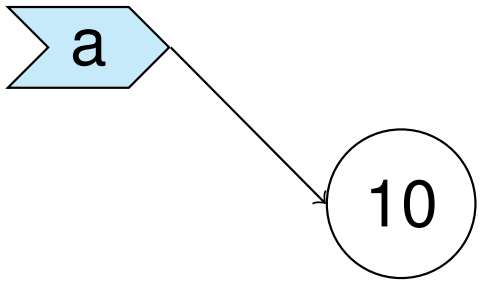

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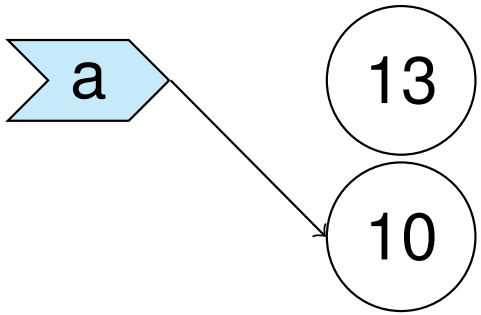

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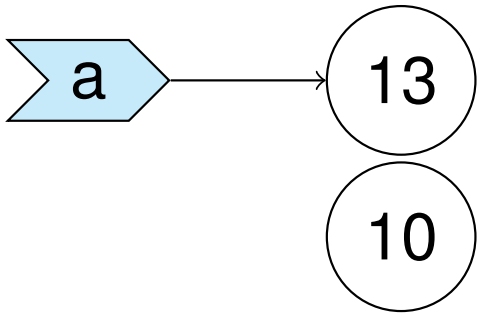

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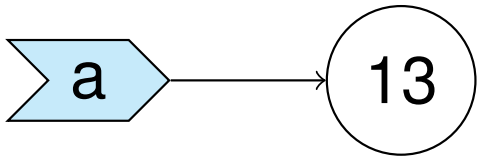

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print(a)
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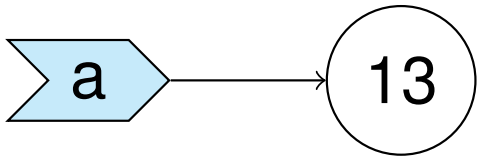


Object

Each object has an `identity`, this value can be obtained by using **`id()`** function.
`==` operator compares values, **`is`** operator compares identities.

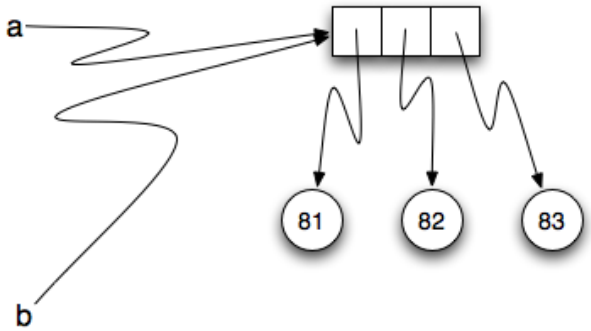
```
a = 1000
b = 1000
a == b   # => True
a is b   # => False

simba_2019 = 'Simba'
simba_cartoon = 'Simba'
simba_2019 == simba_cartoon      # => True
simba_2019 is simba_cartoon      # => False
```

Almost always use `==` to compare values!

Aliasing & Cloning

- More than one variables can refer to **same object**!
- 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.



- `>>> import copy`

`copy.copy(x)`: shallow copy, `copy.deepcopy(x)`: deepcopy

Tuples

- **Immutable** sequence(ordered) of elements.
- Similar to `lists`, you can use **indexing**, **slicing**, and iterate over using `for` loops.
- Elements cannot be added/removed/changed once the tuple is created.
- How to create tuples? **`my_tuple = (1, [1, 2], 'a')`**
- **`len(my_tuple)`** $\Rightarrow$ 3
- **`my_tuple.append(3)`** $\Rightarrow$ **`AttributeError:`** `'tuple' object has no attribute 'append'`

Tuples

`()` / `tuple()`: empty tuple, `(3)`: `int` 3, `(3,)`: `tuple` containing 3

```
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
print(my_tuple)
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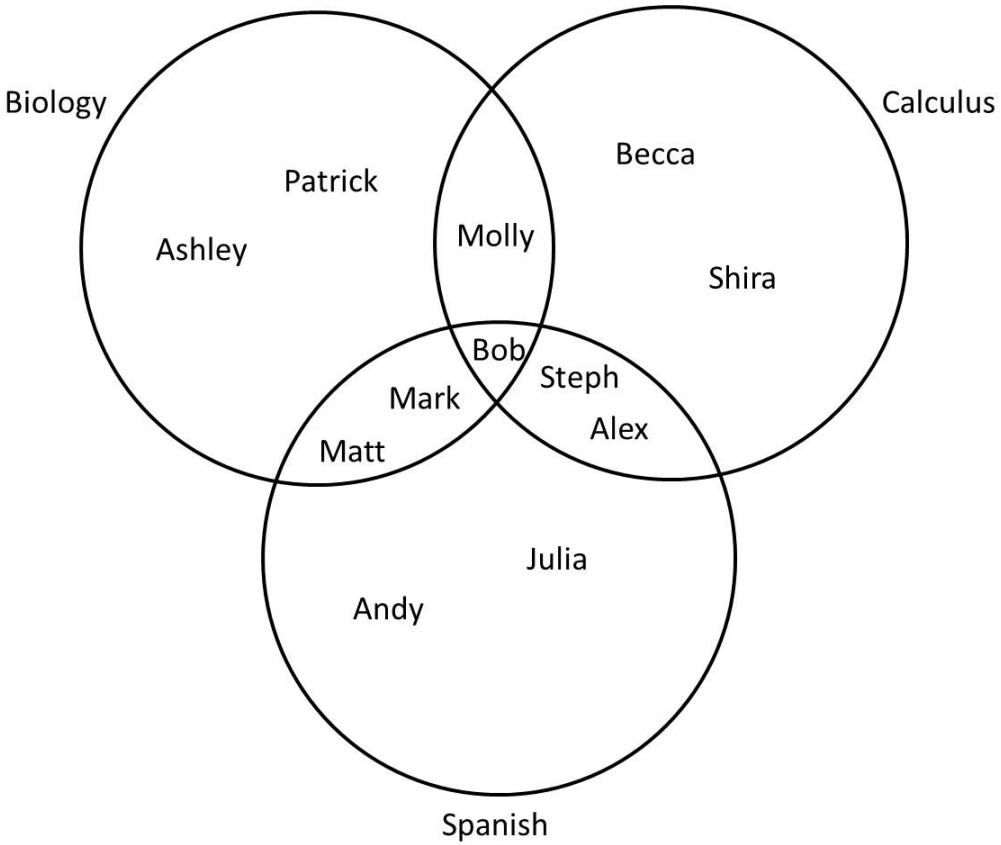
- Can compute set operations: **union**, **intersection**, **difference**, **symmetric difference**.

Sets


Biology
Calculus
Spanish
Patrick
Ashley
Molly
Becca
Shira
Bob
Steph
Mark
Alex
Matt
Julia
Andy

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

Dictionaries

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

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', 'juni
# Ayse passed another year
my_students['Ayse'][1] = 'sophomore'
```

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- **`mode`** denotes how the file will be used:

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- **Always** close the file when you are done: `f.close()`

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- Close the file when you are done.
- `f.close()`

Context Managers

What if something bad happens before we close the file?

```
f = open('my_file.txt', 'r') as f:
    # Content of my_file.txt: '1,0,2'
values = f.read().split(',')
# What happens
result = int(values[0]) / int(values[1]) + int(valu
f.close()
```

```
# Safer approach, file is closed
# even when we encounter an exception
with open('my_file.txt', 'w') as f:
    f.write('Hello, world!')
```

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```
while True:
print('Hello')
# IndentationError: expected an indented block
```

Easy to detect: Your code will not work :)

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How to be safe in these situations?

- Put `if` checks everywhere?
- Too much effort, and probably we cannot list every condition.
- Solution is `try-except-finally` blocks.

Try Except Blocks

```
try:
    <risky-statements >
    <risky-statements >
    <risky-statements >
    ...
except ValueError as valError:
    print('value error', valError)
except (RuntimeError, TypeError, NameError):
    print('One of the above errors, but not ValueError')
else:
    print('No errors')
finally:
    print('This always runs')
```

Try Except Blocks

```
def divide(x, y):
    try:
        result = x / y
    except ZeroDivisionError:
        print("division by zero!")
    else:
        print("result is", result)
    finally:
        print("executing finally clause")
```

Debugging in VS Code

In-class Demo

Refer to *VSCode Python Tutorial* if you have missed the class.