KOLT Python

Basic Operators, Intro to Branching & Simple Functions

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Tuesday 4th February, 2020

KOÇ UNIVERSITY
OFFICE OF LEARNING AND TEACHING

Agenda

1. Recap
2. Basic Operators
3. Branching
4. Objects
5. Basic Functions
    - Defining Functions

Comments

```
# Single line comments start with a '#'

"""
Multiline comments can be written between
three "s and are often used as function
and module comments.
"""
print('Hello, stranger!')
```

Python will basically ignore comments, they are purely written **for humans**!

Variables

Type	Explanation	Examples
`int`	represent **integers**	3, 4, 17, -10
`float`	represent **real numbers**	3.0, 1.11, -109.123123
`bool`	represent **boolean** truth values	`True`, `False`
`str`	A sequence of characters.	'Hello', '', '3'
`NoneType`	special and has one value, None	`None`

- How to create a variable? `variable_name = value`
- How about types? use `type()`
- Can a variable change type? **Yes!** Just assing a new value with any type.
- What if we if want to convert a value between types, i.e, '2'$\rightarrow$ 2?

Casting

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  - Taking user input
  - Reading numbers from a file
- Can we cast every value to every type?
  NO!
  try `int('hello')`

Console I/O(Input/Output)

`print(*args, sep=' ', end='\n')`

- Can take arbitrary number of arguments
- Separates elements with space by default
- Adds newline character `'\n'` to end by default

`input([prompt])`

- Prints the prompt to Console
- Program is paused until user enters something
- **returns an `str` object!**

Arithmetic Operators

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```
3.2 + 1.4   # => 4.6
3.2 - 1   # => 2.2
3.2 * 1.2   # => 3.84
3.5 / 1.5   # => 2.33333335
3.5 // 1.5 # => 2.0
3.5 % 1.5   # => 0.5
2 ** 10   # => 1024
```

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We have already seen `'='`: `variable_name = value`

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Ex: Increment a number: `num = num + 1`

Python has shorter representations for these updates with arithmetic operators.
`num += 1` is equivalent to `num = num + 1`
`result *= 2` is equivalent to `result = result * 2`

Assignment Operators

Operator	Usage	Equivalent
`+=`	`val += 3`	`val = val + 3`
`-=`	`val -= 3`	`val = val - 3`
`*=`	`val *= 3`	`val = val * 3`
`/=`	`val /= 3`	`val = val / 3`
`%=`	`val %= 3`	`val = val % 3`
`**=`	`val **= 3`	`val = val ** 3`
`//=`	`val //= 3`	`val = val // 3`

`bool` Operators

How to represent logical operations in Python?

A	B	A or B	A and B	not A
`True`	`True`	`True`	`True`	`False`
`True`	`False`	`True`	`False`	`False`
`False`	`True`	`True`	`False`	`True`
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- `and`

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WHY?

Operator Precedence

Logical operators are evaluated in this order:

1. `not`
2. `and`
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`(True or False) and False` ⇒ **`False`**

Short-Circuit Evaluation

`X`: Any boolean value

`True or X` ⇒

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`True or X` $\Rightarrow$ **`True`**

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Python is smart enough to take advantage of this!

Short-Circuit Evaluation

`X`: Any boolean value

`True or X` ⇒ **`True`**

`False and X` ⇒ **`False`**

Python is smart enough to take advantage of this!

```
1/0   # => ZeroDivisionError
True or 1/0 # => True
False and 1/0 # => False
1/0 or True # => ZeroDivisionError
1/0 and False # => ZeroDivisionError
```

Truthy & Falsy Values

```
# 'Falsy' values
bool(None) # => False
bool(False) # => False
bool(0) # => False
bool(0.0) # => False
bool('') # => False
# Empty data structures
bool([]) # => False
```

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# Empty data structures
bool([]) # => False
```

```
# Everything else is 'truthy'
bool(-100000) # => True
bool('False') # => True
bool(3.14) # => True
bool(int) # => True
# Nonempty data structures
bool([1, 'a', []]) # => True
bool([False]) # => True
```

Comparison Operators

- $<$: Strictly less than

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- <: Strictly less than
- <=: Less than or equal

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- !=: Not equal

Comparison Operators

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- >: Strictly greater than
- >=: Greater than or equal
- ==: Equal
- !=: Not equal

```
3.0 == 3   # => True
3.0 >= 3   # => True
# Small-case characters
# have bigger ASCII value
'Aa' > 'aa' # => False
'hi' == 'hi'   # => True
'a' == None   # => True
3 > 'a'   # => TypeError
3 == 'a'   # => False
```

Chained Comparisons

$1 < 2 < 3 \Rightarrow$

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$1 < 2 < 3 \Rightarrow$ **`True`**

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You can chain arbitrarily many comparison operations together.

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v_i: variables/values, op_i: comparison operators

$v_1 \;\; op_1 \;\; v_2 \;\; op_2 \;\; v_3 \;\; \ldots \;\; op_{n-1} \;\; v_n$ is equivalent to:

$v_1 \;\; op_1 \;\; v_2$ **`and`** $v_2 \;\; op_2 \;\; v_3$ **`and`** `...` $v_{n-1} \;\; op_{n-1} \;\; v_n$

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v_1 op_1 v_2 **`and`** v_2 op_2 v_3 **`and`** **`...`** v_{n-1} op_{n-1} v_n

```
3 > 2 == 1 < 5 > 4   # => False
3 > (2 == 1) < 5 > 4   # => True
3 > True > False # => True
3 > 5 < 1/0   # => False
3 < 5 < 1/0   # => ZeroDivisionError
```

Branching

Branching

User's age — Greater that 18? —yes— Offer **rakı**

no

Offer **ayran**

Branching

```
if <condition>:
    <expression>
    <expression>
    ...
```

```
if <condition>:
    <expression>
    <expression>
    ...
else:
    <expression>
    <expression>
    ...
```

```
if <condition>:
    <expression>
    <expression>
    ...
elif <condition>:
    <expression>
    <expression>
    ...
...
else:
    <expression>
    <expression>
    ...
```

- `<condition>` has a **`bool`** value (`True` or `False`)
- Which expressions will be evaluated in which conditions?

Python Data Model

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How did we represent data in Python?

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Variables!

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How do they work?

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Objects

Everything is an object in Python.

↪ Values at the right side of our label analogy are objects!

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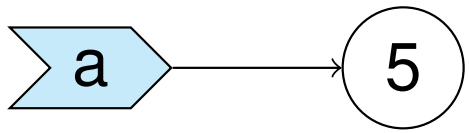

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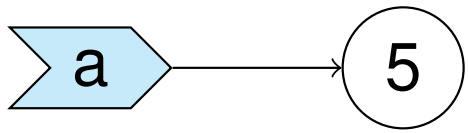

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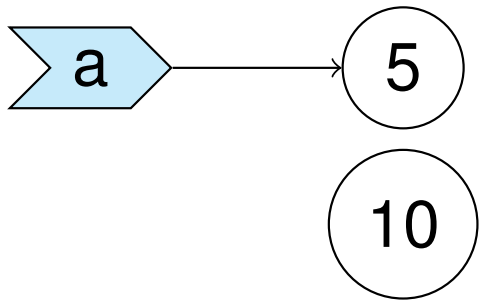

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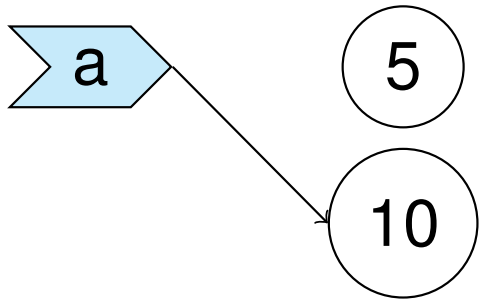

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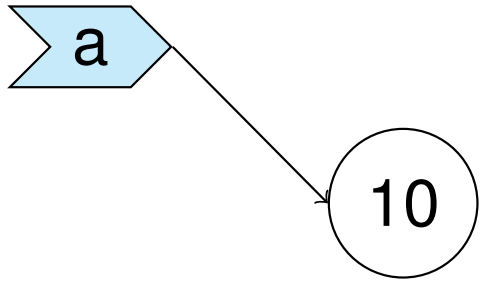

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a = 5
a = 10
a += 3
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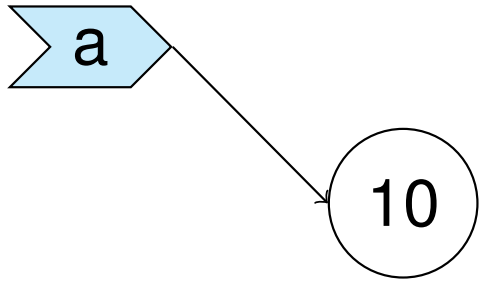

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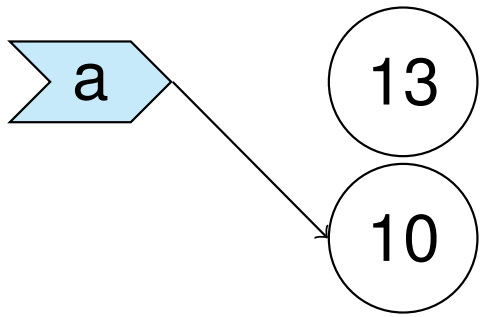

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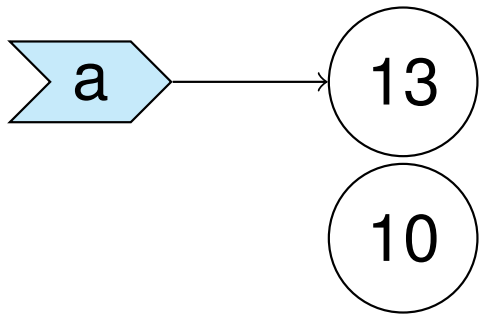

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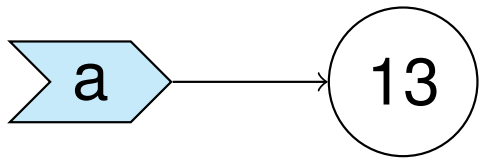

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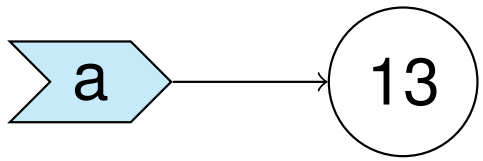
a = 10
a += 3
print(a)
```



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Objects - Identity

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Is this glass half full or half empty?

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```
# What fraction of this glass is water?
pessimist = 0.5
optimist = 0.5
pessimist == optimist       # => True
pessimist is optimist       # => False
```

Objects - Identity

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Functions

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Menemen *without* Onions

```
print("Chop the tomatoes")
print("Deseed and slice the peppers")
print("Cook the vegetables until they soften")
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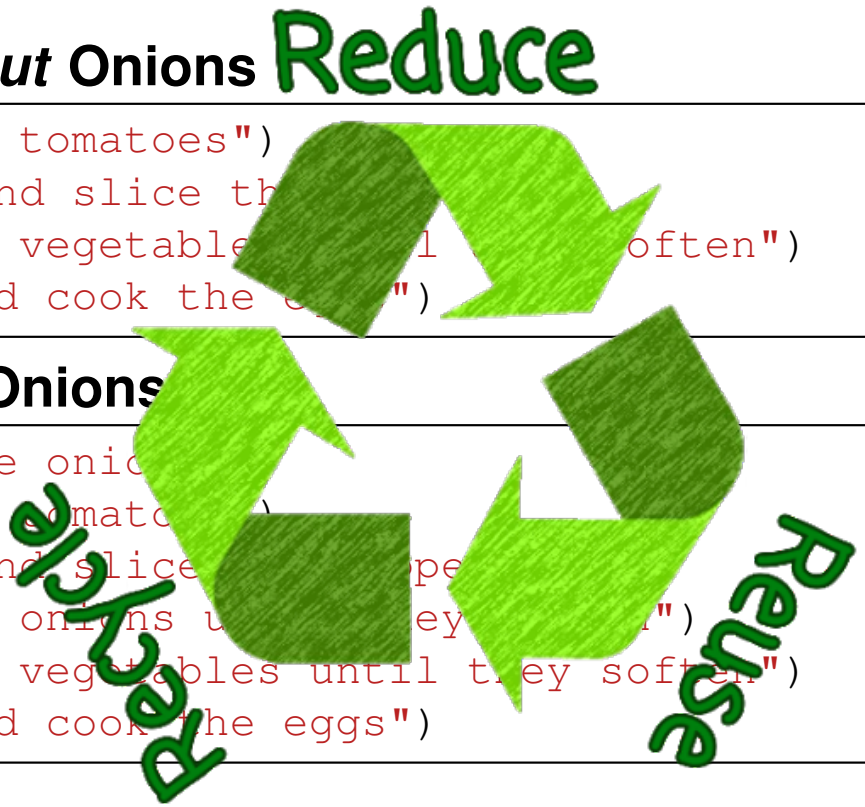

Defining Functions

`def` keyword introduces a function ***definition***.

```
def prepare_base_vegetables():
    print("Chop the tomatoes")
    print("Deseed and slice the peppers")
```

```
def cook():
    print("Cook the vegetables until they soften")
    print("Crack and cook the eggs")
```

Functions

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```
print("Slice the onions")
prepare_base_vegetables()
print("Cook the onions until they soften")
cook()
```

Defining a function = **writing down the recipe**
Calling a function = **executing the recipe**

Functions

You **can** call a function inside another function.

Functions

You **can** call a function inside another function.

```
def menemen_with_onions():
    prepare_base_vegetables()
    cook()
```

Functions

You **can** call a function inside another function.

```
def menemen_with_onions():
    prepare_base_vegetables()
    cook()
```

```
def menemen_without_onions():
    print("Slice the onions")
    prepare_base_vegetables()
    print("Cook the onions until they soften")
    cook()
```