KOLT Python
Functions

İpek Köprülülü

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KOLT

Agenda

1. Recap

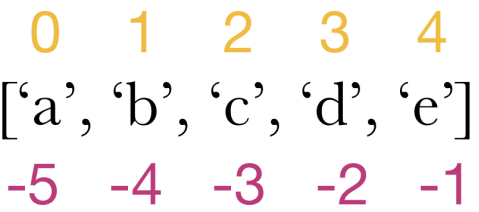
2. Functions

Lists

- Group values together. `my_values = [1, 'a', None]`
- You can think of each element as a variable, accessed by **indexing**
- You can do everything you do to variables to list elements:
  - Assign new values: `my_values[0] = 3`
  - Use shorthand assignment operators: `my_values[1] += 'bc'`
  - Learn their type: `type(my_values[2]) # => <class 'NoneType'>`
  - Change their type: `my_values[2] = True`
  - Compare their value: `if my_values[0] == my_values[1]: ...`
- What happens when we call `my_values[3] = 3`? `# =>` **`IndexError`**

List Indexing

Access elements at a particular index




```
x = [1, 2, 'a', 'hello']
x[0] # => 1
x[1] # => 2
x[2] # => 'a'
x[3] # => 'hello'
x[-1] # => 'hello'
x[-2] # => 'a'
x[-3] # => 2
```

List Slicing

Access collection of elements by specifying **`[start:stop:step]`**
Gives a list, even when number of elements is not bigger than 1.

```
numbers = [0, 1, 2, 3, 4, 5]
"""
ASCII art analogy :)
 +---+---+---+---+---+---+
 | 0 | 1 | 2 | 3 | 4 | 5 | => Indices
 +---+---+---+---+---+---+
 0   1   2   3   4   5   6 => Borders
-6  -5  -4  -3  -2  -1
"""
```

```
numbers[0::2]   # => [0, 2, 4]
numbers[:]  # => [0, 1, 2, 3, 4, 5]
numbers[1:]  # => [1, 2, 3, 4, 5]
numbers[-2:]  # => [4, 5]
numbers[1:4]  # => [1, 2, 3]
numbers[1:1]  # => []
numbers[-99:99]  # => [0, 1, 2, 3, 4, 5]
numbers[::-1]  # => [5, 4, 3, 2, 1, 0]
numbers[::-2]  # => [5, 3, 1]
```

Slices with `step` = 1 are called **Basic Slice**.
Slices with `step != 1` are called **Extended Slice**.

List Mutation

`list.append(x)`: Append x to end of the sequence
`list.insert(i, x)`: Insert x to index i
`list.pop(i=-1)`: Remove and return element at index i
`list.remove(x)`: Remove first occurrence of x
`list.extend(iterable)`: Add all elements in iterable to end of list
`list[i] = new_value`: Update value of index i with new value
`list[basic_slice] = iterable`: Change elements in basic slice with elements in iterable, sizes can be different: `numbers[:] = []`
`list[extended_slice] = iterable`: Change elements in extended slice with elements in iterable 1-1, sizes must be equal.

Some Other List Operations

`in` operator: Check whether an element is in list. `3 in numbers` ⇒ `True`
`len(list)`: Returns the length of list(and other collections).
`list.index(value, start=0, stop=len(list))`: Return first index of value.
`list.count(value)`: Count number of occurrences of value in list.
`list.reverse()`: Reverse the list (in-place)
`list.sort()`: Sort list elements (in-place)
For more, type `help(list)` in your interactive interpreter.

Strings

Special kind of **lists**! `name = 'Python'`
You can do:

- Indexing: `name[2]` ⇒ 't'
- Slicing: `name[::-1]` ⇒ 'nohtyP'
- Search by `in` operator: `'yt'in name` ⇒ `True`

You can not do:

- String mutation: name[2]='H' ⇒ **`TypeError`**

Special functions about strings: `str.isnumeric()`, `str.capitalize()`, `str.format(...)`, `str.find()` ...

Loops

Do something for many elements or based on a condition.

```
while <condition>:
    <expression>
    <expression>
    ...
```

Similar to simple if blocks, but runs again and again until condition check fails.

```
for <item> in <iterable>:
    <expression>
    <expression>
    ...
```

Iterable: collection of **ordered** elements.
What is next after this item?

For Loops

What is next after this item?
numbers[1] is after numbers[0] $\neq$ **numbers[1]** $>$ **numbers[0]**
Examples of iterables: lists, strings, ranges

Ranges

`range(start, stop, step)`: creates a sequence of integers from start (inclusive) to stop (exclusive) by step.
Can be **indexed** and **sliced**
`len()` and `in` operator can be used

For Loops

```
names = ['Mario', 'Peter', 'Anna' ,'Paul' ,'Anna']

for number in range(2, 5):
    # In every iteration, we have a different value from iterable
    # We can access the value with the name we specified
    print(number)
    # range is collection of integers, we can use ints in indexing
    print('Hello', names[number])

    # Nested loops
    for name in names:
        # In every iteration name changes, in the order of names
        if name != names[number]:
            print(name, 'says hello to', names[number])
```

Break, Continue

Break terminates the closest for or while loop

```
for i in range(0, 5):
    if i % 2 == 1:
        break
    print(i)
```

```
x = 1
while x < 100:
    x *= 2
    if (x+1) % 3 == 0:
        break
    print(x)
```

Continue continues with the next iteration of the loop

```
for i in range(0, 5):
    if i % 2 == 1:
        continue
    print(i)
```

```
x = 1
while x < 100:
    x *= 2
    if (x+1) % 3 == 0:
        continue
    print(x)
```

For Else, While Else

`else` in branching: executed when all of the conditions in upper `if`/`elif` blocks are False
`else` in loops: executed when loop is terminated **without** a `break` statement

```
while <condition>:
    <expression>
    if <condition>:
        break
    <expression>
    ...
# This block is executed if
# while loop is not terminated by break
# Note: this block runs even when
# condition is False at initial evaluation
else:
    <expression>
    <expression>
```

```
for item in iterable:
    <expression>
    if <condition>:
        break
    <expression>
    ...
# This block is executed if
# for loop is not terminated by break,
# it iterated all elements
else:
    <expression>
    <expression>
```

Functions

Functions are

- pieces of codes written to carry out some specified tasks.
- used to bundle a set of instructions that you want to use repeatedly.
- block of codes which only call when needed to avoid complexity.

- The def keyword is used to define a new function.

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```
def function_name():
    <expression>
    <expression>
    ...
```

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- The def keyword is used to define a new function.

```
def function_name():
    <expression>
    <expression>
    ...
```

```
def function_name(parameter1, parameter2, ..
    <expression>
    <expression>
    ...
```

Functions

Functions are

- pieces of codes written to carry out some specified tasks.
- used to bundle a set of instructions that you want to use repeatedly.
- block of codes which only call when needed to avoid complexity.

- The def keyword is used to define a new function.

```
def function_name():
    <expression>
    <expression>
    ...
```

```
def function_name(parameter1, parameter2, ..
    <expression>
    <expression>
    ...
```

```
def function_name(parameter1, parameter2, ..
    <expression>
    ...
    return value
```

Functions

```
def sayHello():
    print("Hello")

sayHello() # => Hello
```

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    print("Hello")

sayHello() # => Hello
```

```
def getANumber():
    num = int(input("Enter a number: "))
    print("Your number is", num)

getANumber()

# Enter a number: 10
# Your number is 10
```

Functions

```
def sum(a, b, c):
    print(a+b+c)

sum(1, 2, 3) # => 6
sum(2, 5, 6) # => 13
sum(0, 0, 0) # => 0
```

You should call the function in your code to make it work.

Functions

```
def sum(a, b, c):
    print(a+b+c)

sum(1, 2, 3) # => 6
sum(2, 5, 6) # => 13
sum(0, 0, 0) # => 0
```

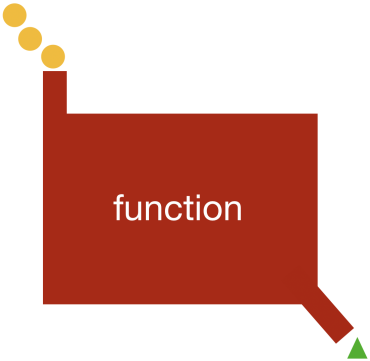
You should call the function in your code to make it work.

```
def factorial(n):
    result = 1
    if n == 0 or n == 1:
        print(1)
    else:
        for i in range(1,n+1):
            result *= i
        print(result)

factorial(0) # => 1
factorial(1) # => 1
factorial(3) # => 6
factorial(4) # => 24
factorial(5) # => 120
```

Return

All functions return some value even if that value is None.



Return

```
def factorial(n):
    result = 1
    if n == 0 or n == 1:
        return 1

    for i in range(1,n+1):
        result *= i
    return result
```

You should call the function and assign it to a variable to hold the value.

```
a = factorial(0)
b = factorial(1)
c = factorial(3)
d = factorial(4)
e = factorial(5)

print(a) # => 1
print(b) # => 1
print(c) # => 6
print(d) # => 24
print(e) # => 120
```

Return

```
def sum(a, b, c):
    return a+b+c

num = sum(1, 2, 3)
print(num) # => 6
```

Return

```
def sum(a, b, c):
    return a+b+c

num = sum(1, 2, 3)
print(num) # => 6
```

```
def double(a):
    return a*2
    print("Doubled")

num = double(4)
print(num)
```

Return

```
def sum(a, b, c):
    return a+b+c

num = sum(1, 2, 3)
print(num) # => 6
```

```
def double(a):
    return a*2
    print("Doubled")

num = double(4)
print(num)
```

Return terminates the function. So, the output is 8.

Default Parameters

The values of parameters can be set to used as default.
In **`print(*args, sep=' ', end='\n')`**, sep and end are defined as default parameters.

```
def info(num, name='NoInfo', surname='NoInfo', ID='NoInfo'):
    print(num, name, surname, ID)
```

Default Parameters

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In `print(*args, sep=' ', end='\n')`, sep and end are defined as default parameters.

```
def info(num, name='NoInfo', surname='NoInfo', ID='NoInfo'):
    print(num, name, surname, ID)
```

```
# 1 positional argument
info(2)
# 2 positional arguments
info(2, 'Jane')
# 3 positional arguments
info(2, 'Jane', 'Doe')
# 4 positional arguments
info(2, 'Jane', 'Doe', 20)
```

```
# 1 keyword argument
info(num=1)
# 2 keyword arguments
info(name='Jane', num=9)
# 2 keyword arguments
info(num=9, name='Jane')
# 1 positional, 1 keyword
info(2, 'John', ID=13)
```

Default Parameters

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In **`print(*args, sep=' ', end='\n')`**, sep and end are defined as default parameters.

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```

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In `print(*args, sep=' ', end='\n')`, sep and end are defined as default parameters.

```
def info(num, name='NoInfo', surname='NoInfo', ID='NoInfo'):
    print(num, name, surname, ID)
```

```
# required argument missing
info()
# non-keyword argument after a keyword argument
info(num=2, 'Jane')
# duplicate value for the same argument
info(2, num=3)
# unknown keyword argument
info(person='Jane')
```

Variadic Positional Arguments

It is used to let the function accept any number of arguments.
In `print(*args, sep=' ', end='\n')`, you can put as many args as you want.

Suppose we want a product function that works as so:
product(3, 5) gives 15.
product(3, 4, 2) gives 24.
product(3, 5, scale=10) gives 150.

Variadic Positional Arguments

It is used to let the function accept any number of arguments.
In **`print(*args, sep=' ', end='\n')`**, you can put as many args as you want.

Suppose we want a product function that works as so:
product(3, 5) gives 15.
product(3, 4, 2) gives 24.
product(3, 5, scale=10) gives 150.

```
def product(*nums, scale = 1):
    p = scale
    for n in nums:
        p *= n
    return p
```

Local & Global Variables

- Local variables are created in functions.
- Global variables are created out of the functions.

```
x = 10 # => global

def func():
    x = 5 # => local
    y = 7 # => local
    print(x, y)

func()
print(x)
```

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    y = 7 # => local
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func()
print(x)
```

```
x = 10

def func():
    print(x)

func() # => 10
```

Local & Global Variables

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    y = 7 # => local
    print(x, y)

func()
print(x)
```

```
x = 10

def func():
    print(x)

func() # => 10
```

```
def func():
    a = 2
    print(a)

func()
print(a) # => not defined (gives error)
```

Local & Global Variables

```
x = 2

def func(num):
    num = 6
    print(num)

func(x)
print(x)
```

Local & Global Variables

```
x = 2

def func(num):
    num = 6
    print(num)

func(x)
print(x)
```

Prints
6
2

Local & Global Variables

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x = 2

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    num = 6
    print(num)

func(x)
print(x)
```

```
x = 2

def func():
    x = 6
    print(x)

func()
print(x)
```

Prints
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2

Local & Global Variables

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    num = 6
    print(num)

func(x)
print(x)
```

Prints
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2

```
x = 2

def func():
    x = 6
    print(x)

func()
print(x)
```

Prints
6
2

Local & Global Variables

```
x = 2

def func(num):
    num = 6
    print(num)

func(x)
print(x)
```

Prints
6
2

```
x = 2

def func():
    x = 6
    print(x)

func()
print(x)
```

Prints
6
2

```
x = 2

def func():
    global x
    x = 6
    print(x)

func()
print(x)
```

Local & Global Variables

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    num = 6
    print(num)

func(x)
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    print(x)

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def func():
    global x
    x = 6
    print(x)

func()
print(x)
```

Prints
6
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Lambda

We can write short functions in one line by using **`lambda`**.

```
function_name = lambda parameter1, parameter2, ... : return_value
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double = lambda x : x*2
```

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function_name = lambda parameter1, parameter2, ... : return_value
```

```
def double(x):
    return x*2
```

```
def sumAndPrint(x,y,z):
    print(x+y+z)
```

```
double = lambda x : x*2
```

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def double(x):
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```
double = lambda x : x*2
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def sumAndPrint(x,y,z):
    print(x+y+z)
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```
sumAndPrint = lambda x,y,z : print(x+y+z)
```

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def double(x):
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```
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```

```
def sumAndPrint(x,y,z):
    print(x+y+z)
```

```
sumAndPrint = lambda x,y,z : print(x+y+z)
```

```
def reverseString(s):
    return s[::-1]
```

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def reverseString(s):
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reverseString = lambda s: s[::-1]
```