KOLT Python

Lists, For Loops & Functions

Ahmet Uysal

Monday 14th October, 2019

KOLT

Agenda

1. Recap

2. Lists

3. For Loops

4. Functions

Strings

```
my_string = 'abcde'
```

0	1	2	3	4
'a	b	c	d	e'
-5	-4	-3	-2	-1

`print(my_string[2])` $\Rightarrow$ prints c
`print(my_string[-2])` $\Rightarrow$ prints d

Indexing & Slicing

Access specific characters using **indexing**, i.e, **`[index]`**
Slice strings by using **`[start:stop:step]`**

```
s = 'Python'
s[1] # => 'y'
s[0:4] # => 'Pyth'
s[:3] # => 'Pyt'
s[3:] # => 'hon'
s[:] # => 'Python'
```

```
s = 'Python'
s[:5:2] # => 'Pto'
s[1:4:3] # => 'y'
s[::3] # => 'Ph'
s[::-1] # => 'nohtyP'
```

String Operations

```
print('This a simple calculator program.')
number1 = input('Please enter the first number:')
number2 = input('Please enter the second number:')
print(f'{number1}+{number2} is {number1 + number2}')
```

```
number1 = int(input('First number:'))
number2 = input('Please enter the second number:')
print(f'{number1}x{number2} is {number1 * number2}')
```

`str1 + str2` $\Rightarrow$ **Concatenate** `str1` and `str2`

`str1 *` n $\Rightarrow$ Repeate `str1` n times.

While Loops

Repeat some `<expression>`s as long as a `<condition>` is `True`.

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

```
x = 15
while x > 10:
    print(x)
    x-=1
```

```
counter = 11
while counter > 6:
    counter -= 1
    print(2**counter)
    counter -= 1
```

`<condition>` is only checked **before** each execution.

Lists

Imagine variables, but with limitless capacity. . .

```
sunnyside = ['Mr.  Potato Head', 'Hamm',
'Buzz Lightyear', 'Slinky Dog']
```

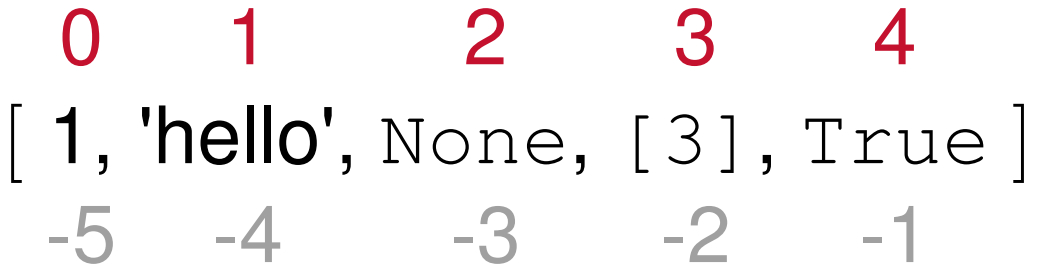
Lists

```
empty_list = []
letters = ['a', 'b', 'c', 'd']
numbers = [2, 3, 5]
```

```
mixed_list = [4, 13, 'hello']
```

Accessing Elements

```
values = [1, 'hello', None, [3], True]
```



Use **indexing** to access and **update** elements inside list.

```
print(values[2])
values[2] = 'new value'
```

Adding New Elements

Append elements at the end of a list by **append()**

```
numbers = [1, 2, 3]
numbers.append(7) # => numbers = [1, 2, 3, 7]
numbers.append(11) # => numbers = [1, 2, 3, 7, 11]

a_list = [1, 'a', 'python', 4.2]
a_list.append(3) # => a_list = [1, 'a', 'python', 4.2, 3]
a_list.append('hello')
# => a_list = [1, 'a', 'python', 4.2, 3, 'hello']
```

```
x = [1, 2, 3]
y = [4, 5]
x.append(y) # => x = [1, 2, 3, [4, 5]]
```

Inspecting List Elements

Slice lists by using `[start:stop:step]`

```
x = [1, 2, 3, 4, 5]

x[2:4] # => [3,4]
x[3:4] # => [4]
x[1:-1] # => [2,3,4]
```

```
y = ['a', 'b', 'c', 'd', 'e', 'f']

y[:3] # => ['a', 'b', 'c']
y[2:] # => ['c', 'd', 'e', 'f']
y[:-1] # => ['a', 'b', 'c', 'd', 'e']
y[:] # => ['a', 'b', 'c', 'd', 'e', 'f']
```

Inspecting List Elements

```
y = ['a', 'b', 'c', 'd', 'e', 'f']

y[1:5:2] # => ['b', 'd']
y[::3] # => ['a', 'd']
```

```
y = ['a', 'b', 'c', 'd', 'e', 'f']

y[::-1] # => ['f', 'e', 'd', 'c', 'b', 'a']
```

Lists (Cont.)

Removing An Element

Remove elements in a list by **remove()**

```
numbers = [1, 2, 3, 4]
numbers.remove(2) # => numbers = [1, 3, 4]

letters = ['a', 'b', 'c']
letters.remove('b') # => letters = ['a', 'c']

numbers_repeated = [1, 2, 5, 4, 2, 6]
numbers_repeated.remove(2) # => number_repeated = [1, 5, 4, 2, 6]

my_list = [1, 'a']
my_list.remove('b') # => ValueError
```

How to avoid `ValueError`? (Hint: **Branching**)

in Operator

Search an operand in the specified sequence by using **in**

```
0 in [] # => False
'y' in  'Python' # => True
23 in ['hello', 40, 'a', 5] # => False
23 in ['hello', 40, 'a', 23] # => True
23 in ['hello', 40, 'a', '23'] # => False
```

- Works with both lists and strings
- Works with ranges

len() Function

`len()` is an operator to determine the size of lists, strings, etc.

```
s = 'Python'
len(s) # => 6

my_list = [0, 1, 2, 3]
len(my_list) # => 4
```

List Slicing

Access collection of elements with **`[start:stop:step]`**
Gives a list, even when number of elements is not bigger than 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.
`list.reverse()`: Reverse the list (in-place)
`list.sort()`: Sort list elements (in-place)

For more, type `help(list)` in your interactive interpreter.

range() Function

`range(`**`start, stop, step`**`)` is a function to create ranges

```
a = range(3) # => generates 0, 1, 2
b = range(0,3) # => generates 0, 1, 2
c = range(2,4) # => generates 2, 3
d = range(0,6,2) # => generates 0, 2, 4
0 in a # => True
1 in b # => True
4 in c # => False
2 in d # => True
6 in d # => False
```

For Loops

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

```
for ch in 'Python':
    print(ch)
```

```
for num in [4,23,12,0,50]:
    print(num * 3,sep=".")
```

```
for i in range(0,8):
    print(i)
```

For Loop Example

TODO: Add example

Break, Continue & Pass

`break` immidiately terminates the closest 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` skips to 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)
```

Break, Continue & Pass

`pass` does not have an effect

```
for letter in 'Python':
    if letter == 'y':
        pass
    else:
        print(letter)
```

- Loops, conditional statements, functions etc. cannot be empty

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, param
    <expression>
    <expression>
    ...
```

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

Functions

```
def sayHello():
    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
```

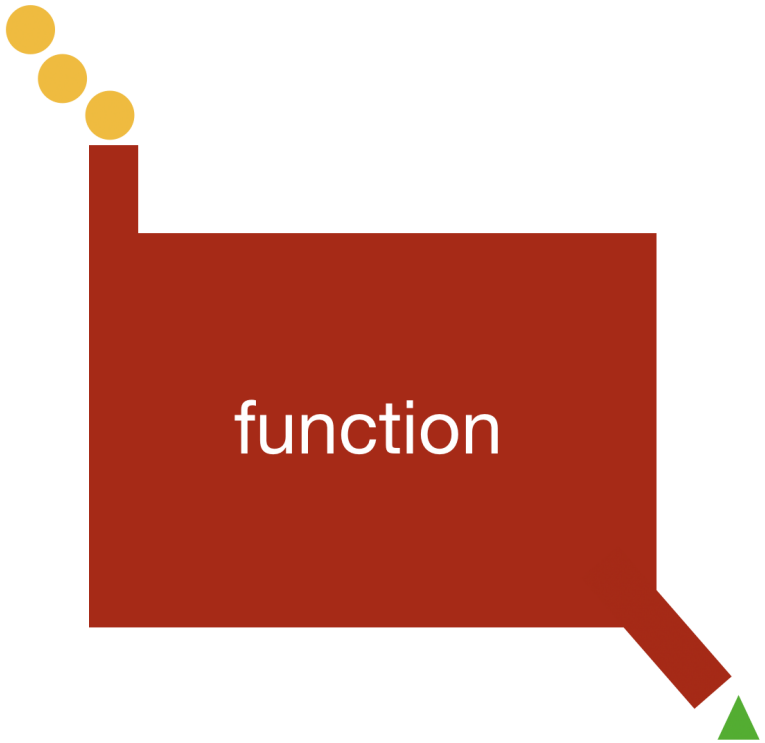
You should call the function in your code to make it work.

```
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
```

```
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)
```

```
# 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

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)
```

```
# 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.

```
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)
```

```
x = 10

def func():
    print(x)

func() # => 10
```

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

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

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)
```

Prints
6
6

Lambda

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

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

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

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

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

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

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

```
reverseString = lambda s: s[::-1]
```