Higher Order Functions and Lambdas - 1

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1 Higher order functions

1. Higher order function is a function which takes another function as it's arguement
2. In Python there are two built_in higher order functions available
3. map()
4. filter()

1.1 map(func, iterable)

1. map() takes two arguments, a function (built_in or user defined) and iterable.
2. It applies the given function on every item of the iterable and returns a mapping object as result
3. Returned mapping object will often be converted (or unpacked) into lists or tuples or dictionaries depending upon the requirements.

1.1.1 Examples of map()

[ ]:
```
# 1. You want to read multiple values in a single line
# a, b, c = map(int, input().split())
# 2. When you are required read a list of elements
# lst = list(map(int, input().split()))
```

1.1.2 Built_in functions in python

1. sum()
2. len()
3. max()
4. min()
5. abs()
6. ord()
7. chr()
8. list()
9. set()
10. tuple()
11. int()
12. float()
13. str()
14. bool()
15. bin()

'math module functions' 1. math.sqrt() 2. math.factorial() 3. math.ceil() 4. math.floor()

[9]:
```
fruits = ['apple', 'orange', 'kiwi']
lengths = list(map(len, fruits))
lengths = [len('apple'), len('orange'), len('kiwi')]
```

[9]:
```
[5, 6, 4]
```

[10]:
```
fruits = ['apple', 'orange', 'kiwi']
x = list(map(max, fruits))
x
```

[10]:
```
['p', 'r', 'w']
```

[12]:
```
fruits = ['apple', 'orange', 'kiwi']
y = list(map(min, fruits))
y
```

[12]:
```
['a', 'a', 'i']
```

[14]:
```
l = [10, 20, 30]
z = list(map(sum, l))
z
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Input In [14], in <cell line: 2>()
      1 l = [10, 20, 30]
----> 2 z = list(map(sum, l))
      3 z

TypeError: 'int' object is not iterable
```

[13]:
```
sum(10)
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Input In [13], in <cell line: 1>()
----> 1 sum(10)

TypeError: 'int' object is not iterable
```

[16]:
```
l = [[40, 50], [60, 70], [45, 55]]
z = list(map(sum, l))
z
```

[16]:
```
[90, 130, 100]
```

[18]:
```
s = 'helloworld'
x = list(map(ord, s))
x
```

[18]:
```
[104, 101, 108, 108, 111, 119, 111, 114, 108, 100]
```

[20]:
```
numbers = [65, 97, 67, 100]
x = list(map(chr, numbers))
x
```

[20]:
```
['A', 'a', 'C', 'd']
```

[21]:
```
alphabets = list(map(chr, range(97, 123)))
alphabets
```

[21]:
```
['a',
 'b',
 'c',
 'd',
 'e',
 'f',
 'g',
 'h',
 'i',
 'j',
 'k',
 'l',
 'm',
 'n',
 'o',
 'p',
 'q',
 'r',
 's',
 't',
 'u',
 'v',
 'w',
 'x',
 'y',
 'z']
```

[42]:
```
l = ['10', '20', '30', '40']
x = list(map(int, l))
print(x)
```

```
[10, 20, 30, 40]
```

[44]:
```
l = ['10.2', '20.2', '40.3']
x = list(map(float , l))
print(x)
```

```
[10.2, 20.2, 40.3]
```

[46]:
```
l = [11, 3, 46, 12]
x = list(map(bin, l))
print(x)
```

```
['0b1011', '0b11', '0b101110', '0b1100']
```

[47]:
```
l = [10, 12, -10, 13, -4]
x = list(map(abs, l))
print(x)
```

```
[10, 12, 10, 13, 4]
```

[27]:
```
a, b, c = map(int, input().split())
print(a)
print(b)
print(c)
```

```
10
20
30
```

[28]:
```
import math
l = [4, 9, 16, 25, 36]
square_roots = list(map(math.sqrt, l))
print(square_roots)
```

```
[2.0, 3.0, 4.0, 5.0, 6.0]
```

[48]:
```
l = [1, 2, 3, 4, 5]
factorials = list(map(math.factorial, l))
print(factorials)
```

```
[1, 2, 6, 24, 120]
```

[52]:
```
l = [10.2, 15.4 ,13.3, 124.74]
x = list(map(math.ceil, l))
print(x)
```

```
[11, 16, 14, 125]
```

[53]:
```
l = [10.2, 15.4 ,13.3, 124.74]
x = list(map(math.floor, l))
print(x)
```

```
[10, 15, 13, 124]
```

1.1.3 User defined functions in map

[30]:
```
nums = [1, 3, 9]
def cube(n):
    return n**3
c = list(map(cube, nums))
print(c)
```

```
[1, 27, 729]
```

[31]:
```
nums = [10, 14, 3, 12]
# x = ['Even', 'Even', 'Odd', 'Even']
def eo(n):
    if n%2 == 0:
        return 'Even'
    else:
        return 'Odd'
x = list(map(eo, nums))
print(x)
```

```
['Even', 'Even', 'Odd', 'Even']
```

[33]:
```
marks = [[34, 45, 66], [32, 49, 71], [86, 42, 21]]
# summary = [[34, 66, 145], [32, 71, 152], [21, 86, 149]]
def x(l):
    return [min(l), max(l), sum(l)]
summary = list(map(x, marks))
print(summary)
```

```
[[34, 66, 145], [32, 71, 152], [21, 86, 149]]
```

2 Filter(func, iterable)

1. Filters out the values from the iterable using given function
2. Returns a filter object

[39]:
```
def is_even(n):#10
    return n%2 != 0

nums = [10, 12, 13, 17, 19, 16]
x = list(filter(is_even, nums))
print(x)
```

```
[13, 17, 19]
```

[41]:
```
def is_vowel(ch):
    vowels = 'aeiou'
```

```
    return ch in vowels
s = 'helloworld'
x = list(filter(is_vowel, s))
print(x)
```

```
['e', 'o', 'o']
```

[40]:
```
def b_50(n):
    return n<=50
ages = [10, 20, 43, 54, 66, 77, 3]
x = list(filter(b_50, ages))
print(x)
```

```
[10, 20, 43, 3]
```

[ ]:
```

```