

list comprehension 【串列解析】

授課老師：邱淑怡

DATE: 11/7/2023

串列解析(**list comprehension**): 提供一種更簡潔的方法建立串列

利用單行For迴圈產生List資料組



圖1 單行For迴圈的功能示意圖

Syntax of list comprehension:
[expression for item in list]
Ex: list_num=[letter for letter in 'human']

- list_name=[自訂變數 for 自訂變數 in 資料組 (if 關係運算式)]
- newlist=[expression for item in iterable (if condition == True)]
- Example:如果要產生一個1到10的整數數列，並且存入list資料組

```
num_list=[]  
for i in range(1,11)  
    num_list +=[i]
```

==

```
num_list=[i for i in range(1,11)]
```

題目: 印出 **python** 的每一個字元

List comprehension vs. for loop vs. lambda function

FOR LOOP

```
h_letters = []  
for i in 'python':  
    h_letters.append(i)  
print(h_letters)
```

List comprehension

```
Letters_com = [ x for x in 'python' ]  
print( letters_com)
```

LAMBDA FUNCTION

```
letters = list(map(lambda x: x, 'python'))  
print(letters)
```

Map function: map(function,list)

<Example code>

```
def square(x) :  
    return x ** 2  
map(square, [1,2,3,4,5])
```

```
list(map(lambda x: x ** 2, [1, 2, 3, 4, 5]))
```

Conditionals in list Comprehension

- Using if with list comprehension
 - listA= [x for x in range(20) if x % 2 ==0]
- Nested if with list comprehension
 - listB= [y for y in range(100) if y%2==0 if y%5==0]
- if...else with list comprehension
 - listC=["Even" if i%2==0 else "Odd" for i in range(10)]

串列解析 (**list comprehension**) 例子

串列的中括號裡面有一個for敘述，後面跟著0個、1個或多個for或if敘述

- `list1=[i for i in range(10)]`
- `print(list1)`
- `list2=[i*2 for i in range(10)]`
- `print(list2)`
- `list3=[i for i in range(10) if i<8]`
- `print(list3)`
- `lista=[-1,-5,-2,0,4,8]`
- `listb=[abs(i) for i in lista]`
- `print(listb)`
- `listc=[i for i in lista if i>=0]`
- `print(listc)`
- `listd=[i**2 for i in lista]`
- `print(listd)`

練習題

基礎代謝率 (BMR) 是維持重要功能 (如呼吸, 消化和循環) 所需的最低能量水平。請撰寫Python程式能計算每個同學的基礎代謝率

BMR公式對於男性和女性是不同的, 修改哈里斯-本尼迪克特(Harris-Benedict principle):

- 男: $66 + (13.7 \times \text{體重kg}) + (5 \times \text{身高cm}) - (6.8 \times \text{年齡})$
- 女: $655 + (9.6 \times \text{體重kg}) + (1.8 \times \text{身高cm}) - (4.7 \times \text{年齡})$
- 運動習慣(codebook):
 - 1: 非常少運動, 將BMR乘以1.2
 - 2: 很少運動 (1-3天/週), 將BMR乘以1.375
 - 3: 正常運動 (3-5天/週), 將BMR乘以1.55
 - 4: 經常鍛煉 (6-7天/週), 將BMR乘以1.725
 - 5: 天天鍛煉 (每天可以一天兩次), 將BMR乘以1.9
- `data = [['Amy', 'female', 160, 65,23,3],['Bob', 'male', 180, 83,30,2],['Cathy', 'female', 172, 66,20,2],['David', 'male', 177, 92,35,2]] -> [name,sex,height,weight,age,exercise]`

**Compute and save them in a list. Then, print them. For example:
Amy BMR=???**