程式設計概論
Programming 101
—其他資料型態
tuples, dictionaries, sets

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Outline

- Python資料結構
  - Sequence
    - List
    - **tuple**
  - Non-sequence
    - **dictionary**
    - **set**

sequence(序列): list and tuple

- operators
  - The + and * operator
  - Subscript indexing for retrieving element values
  - The >, <, >=, <=, ==, != operator
  - The in and not in operator
  - Slicing expressions: variable_name[start:end:step]

Tuple(序對)

Tuple(序對)

- A tuple is an immutable sequence, which means that it **cannot be changed**
- A tuple is a sequence, very much like a list.
- Once a tuple is created, it cannot be changed
- You enclose its elements in a set of parentheses*()* to create a tuple.
- tuple2=(1,2,3)
- tuple3=tuple(range(5))

Tuple operation

- Notice: tuple cannot be changed : T[0]=100 (error)
- + operator (連接運算子)
  - (1,2,3)+("Taipei","Tokyo","Vienna")
- * operator (重複運算子)
  - 3*(1,3,6)
- >, <, >=, <=, ==, != operators
  - (1,"Python","R") == ("Python","R",1) #False
  - (1,2,3) < (1,2,3,4) # True
- in 和 not in operator
  - "Taipei" in (1, "Taipei", 2, "Tokyo") # True
- Indexing and slicing: tuple_name[start:end:step]

Tuple operation(cont.)

- Indexing and slicing

```
T=(5,10,15,20, 25, 30, 35, 40)
T[0] # 索引第一個元素
T[2 : 5]    #索引2到4的元素(不含索引5)
T[-1]       # 索引最後一個元素
T[6 : -1]  #索引6到-2的元素(不含索引-1)
```

dictionaries

dictionary

- A dictionary is an object that stores a collection of data.
- Each element in a dictionary has two parts: a key and a value (*key-value* pairs).
- You use a key to locate a specific value.
  - Retrieve a value from a dictionary ➔ ***dict_name[key]***
- Key-value pairs are often referred to as *mappings* because each key is mapped to a value.
- Create a dictionary by enclosing the elements inside a set of curly braces ({}).
- Example: phonebook={'Chris':'555-1111','Katie':'555-2222', 'Joanne':'555-3333'}

dictionary (cont.)

- The values in a dictionary can be objects (任何資料型態)
- The keys must be immutable objects, keys can be strings, integers, floating-point values, or tuples. Keys cannot be lists or any other type of immutable object.
- Cannot have duplicate keys in a dictionary. (「鍵」是唯一的)
  - When you assign a value to an existing key, the new value replaces the existing value.
- Create an empty dictionary: dict_1=dict() or dict_1={}

```
E=dict()
E1={}
EA={"one":1,"two":2, "three":3}
EB=dict({"three":3,"two":2,"one":1})
EC=dict(one=1,two=2,three=3)
ED=dict([("two",2),("one",1),("three",3)])
print(ED)
```

dictionary operator

- dictionaries are unordered
  - **不支援**連接運算子(+)、重複運算子(*)、索引運算子([])、片段運算子([start:end])或其他與順序相關的運算
- The in and not in operator: check if a key exists in the dictionary
- The == and != operator

dict: add, delete, modify

Add or modify:
dict_name[key]=value

Delete
del dict_name[key]

```
pwd={'Justin':10912398, 'John':10812890}
print(pwd['Justin'])
pwd['Helen']=10897281  #add key_value
pwd['Helen']=10897310  # modify value
print(pwd)
del pwd['John']  # del key為John的key_value
print(pwd)
print(pwd.items())
print(pwd.keys())
print(pwd.values())
print(pwd.get('Helen'))
```

dict: add, delete, modify (cont.)

D1==D2➔ D1and D2 the same key-value pairs, returning **True**

```
EA={"one":1,"two":2, "three":3, "four":4, "five":5}
len(EA)
#使用for迴圈走訪dict中所有的鍵:值對
    for key in EA:
        print("鍵為",key,"所對映的值為",EA[key])
EA.get("one") #傳回鍵為”one”所對映的值
EA.pop("three") #刪除鍵為”three”的鍵:值並傳回值
EA.popitem() #刪除最後一個鍵:值並傳回該鍵:值對
```

practice

EA={"one":1,"two":2, "three":3}
EB=dict({"four":4,"two":2,"one":1})
EC=dict({"three":3,"two":2,"one":1})
判斷'one'是否在EA dict內
判斷'ten'是否在EA dict內
判斷 EA與EB是否不相等
判斷 EA與EC是否相等

dictionary functions in this class

len(dict_name)
dict_name.copy()
dict_name.get(key): get its value
dict_name.items(): get(key,value)
key in dict_name: get True/False
dict_name.keys(): get all keys in dict_name
dict_name.values(): get all value in dict_name
dict_name.update(dict_new)

set(集合)

SET

- A set contains a collection of unique value and work like a mathematical set.
- A set cannot contain duplicate elements.
- Sets are unordered.
  - 集合沒有連接運算子(+)、重複運算子(*)、索引運算子([])、片段運算子([start:end])或其他與順序有關的運算
- Create an empty set: set1=set()
- set2={“Taipei”,”NY”}
- set3=set([1,2,3,3,2,2])
- set4=set(range(5))

SET: >, <, >=, <=, ==, !=

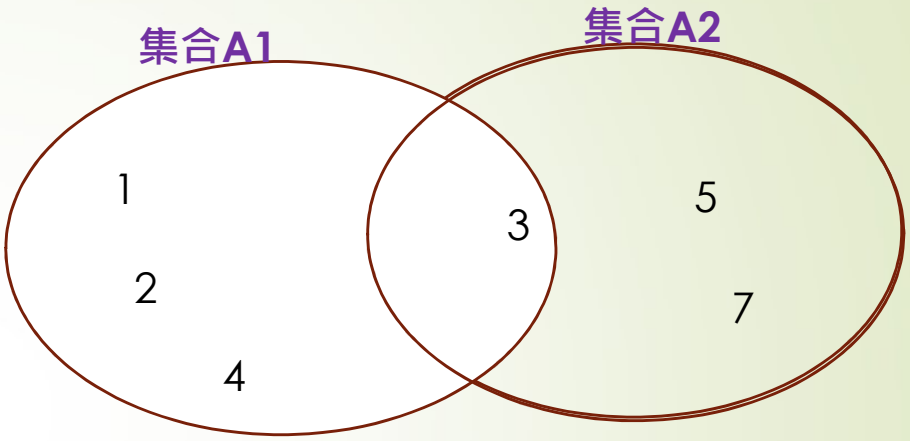
```
S1={'Python','Java','matlab'}
S2={'Python','Java','matlab','R'}
S3={'Python','matlab','Java'}
print(S1==S3)   #True
print(S1 != S2)     #True
print(S1<= S2)   # True (S1 is a subset of S2)
print(S1< S2)
```

SET操作

- S1={10, 20, 30, 40, 50}
- S1.add(60)
- S1.remove(30)
- S1.pop()
- S2=S1.copy()
- S1.clear()

The operations of any two sets

- Union:聯集(|)
- Intersection:交集(&)
- Difference set:差集(-)
- Mutually exclusive互斥(^)




```
A1=set('1234')
A2=set('357')
print(A1|A2)
print(A1&A2)
print(A1-A2)   # A2-A1=?
print(A1^A2)
```

多重結構

A two-dimensional list (二維串列)

- A two-dimensional list is a list that has other lists as its elements
- Ex:儲存五個學生國英數成績
  g_list=[[96,65,73],[88,76,82],[92,84,89],[82,73,64],[70,83,68]]

	國文	英文	數學
學生1	96	65	73
學生2	88	76	82
學生3	92	84	89
學生4	82	73	64
學生5	70	83	68

對應的索引值

	國文	英文	數學
學生1	g_list[0][0]	g_list[0][1]	g_list[0][2]
學生2	g_list[1][0]	g_list[1][1]	g_list[1][2]
學生3	g_list[2][0]	g_list[2][1]	g_list[2][2]
學生4	g_list[3][0]	g_list[3][1]	g_list[3][2]
學生5	g_list[4][0]	g_list[4][1]	g_list[4][2]

Examples

- create a contact book: name, score, and phone number.
- con_dict
  - key: name
  - value: score, phone_number

Student exercise_6

Question 1

- 請用Python程式設計一個市場調查的實例，首先要求使用者輸入名字及夢幻旅遊地點，然後存入survey_dict字典，其中鍵(key)是name，值(value)是travel_location，輸入後程式會詢問是否還有人要輸入，y表示有，n表示沒有則程式結束，程式結束前輸出市場調查的結果(顯示有哪些人名的夢幻旅遊地點是哪個地點)

Question 2

- dict1={‘小花’:90,’小明’:86,’小莉’:56}請將dict1中的資料，運用list()函式將key和value轉成list，分別存在keys_list及values_list，再用loop將key及value個別印出來
- 印出結果:第1筆資料:key=小花 value=90...

Question 3

- 請使用者輸入兩段中文的文字，程式會找出兩段文字的共同字。

Question 4

- 男生標準體重：(身高- 80) * 0.7
- 女生標準體重：(身高- 70) * 0.6
- 請算出（體重減標準體重）的平均值
- data = [['Amy', 'female', 160, 65],['Bob', 'male', 180, 83],['Cathy', 'female', 172, 66],['David', 'male', 177, 92]]
- print(sum(???) / len(data))

Hint: [1,3,5]+[2,4] ➔ [1,3,5,2,4]

Advanced Question 5

- 請撰寫一個Python程式，利用內建函式sorted傳入欲排序的串列，並以參數key指定以何物為排序依據，串列為list1=[['apple',25],['orange',10],['fig',12],['lemon',20]]，請定義三個函式為排序的依據，分別是:依據水果名的字母順序、依據水果名稱的長度、依據水果的價格。

Review

Textbook: chapter 8.9 and chapter 10