



程式設計概論 Programming 101

—String operation (字串變數的操作)

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Outline

- String generation
- Basic operations on strings: addition and multiplication
- Reference: searching and manipulation strings
- Build-in function: len() function

String(字符串)

- Strings: contain characters
- Strings are enclosed by two single quotes(') or two double quotes("")
- String addition: concatenate strings
- String multiplication
- Select substring
- Calculate the length of a string: `len(string_name)`

Example_1

- `print("ABC"+"abc")`
- `print("ABC","abc")`
- `print("ABC"+"abc"+"*-/")`
- `print("ABC"*3)`
- `print(2*"abc")`
- `print(len('abcde'))`

Indexing & string slicing

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- Accessing the individual characters in a string is with an index.
- Each character in a string has an index that specifies its position in the string.
- `x1='Python程式設計'`

Index	0	1	2	3	4	5	6	7	8	9
Character (內容)	P	y	t	h	o	n	程	式	設	計
index	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1

```
print(x[0]) # out P
print(x[1]) # output y
print(x[6]) # output 程
print(x1[-1]) # output 計 (印出最後一個字元)
print(x1[-6]) # output o
print(len(x1)) # output 10 (印出該字串的長度)
```

Python uses 0 as the starting index.

Indexing & string slicing (cont.)

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- `x1='Python程式設計'`

`x1[a:b]`: 取出`x1`的索引值從`a`到`b`前一個字元的內容 (p.349)

index	0	1	2	3	4	5	6	7	8	9
內容	P	y	t	h	o	n	程	式	設	計
索引	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1

```
print(x1[2:5])    # 'tho'
print(x1[3:7])    # 'hon程'
print(x1[6:-1])   # '程式設'
print(x1[:2])     # 印出索引0,1 (不包含2)
print(x1[2:])     # 印出索引2...9 (不包含10)
print(x1[9:10])  # 取出最後一個字元印出
```

`in, not in` → result True/False

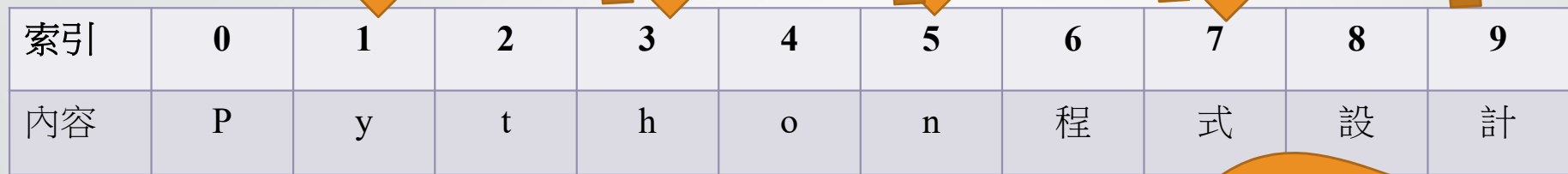
```
print("Py" in "Python")
print("py" in "Python")
```

Practice

string1='python programming code'

- Q1: print program substring from string1
- Q2: print python substring from string1
- Q3: print python_code substring from string1

字串的片段運算子(進階)



The diagram illustrates string slicing on the string 'Python程式設計'. A table shows the characters and their indices from 0 to 9. Four curved orange arrows above the table indicate slicing operations: from index 1 to 3, from index 3 to 5, from index 5 to 7, and from index 7 to 9.

索引	0	1	2	3	4	5	6	7	8	9
內容	P	y	t	h	o	n	程	式	設	計

- `x1='Python程式設計'`
- `x1[a:b:c]=x1[開始索引值:(結束索引值的後一個):遞增量]`
 - `a, b, c`皆為正或負整數
 - `(b-a)`的數值=欲取出子字串的長度
 - `c`代表遞增量及方向
 - `a`:若沒有寫預設值0
 - `b`:若沒有寫預設值到最後一個數值
 - `c`:若沒有寫預設值1
- `print(x1[0:8:2])`
- `print(x1[::-2])`

`x1[-1:0:-2]`



The diagram shows the slicing operation `x1[-1:0:-2]` on the string 'Python程式設計'. An orange arrow points from the bottom of the slide up to a box containing the code `x1[-1:0:-2]`.

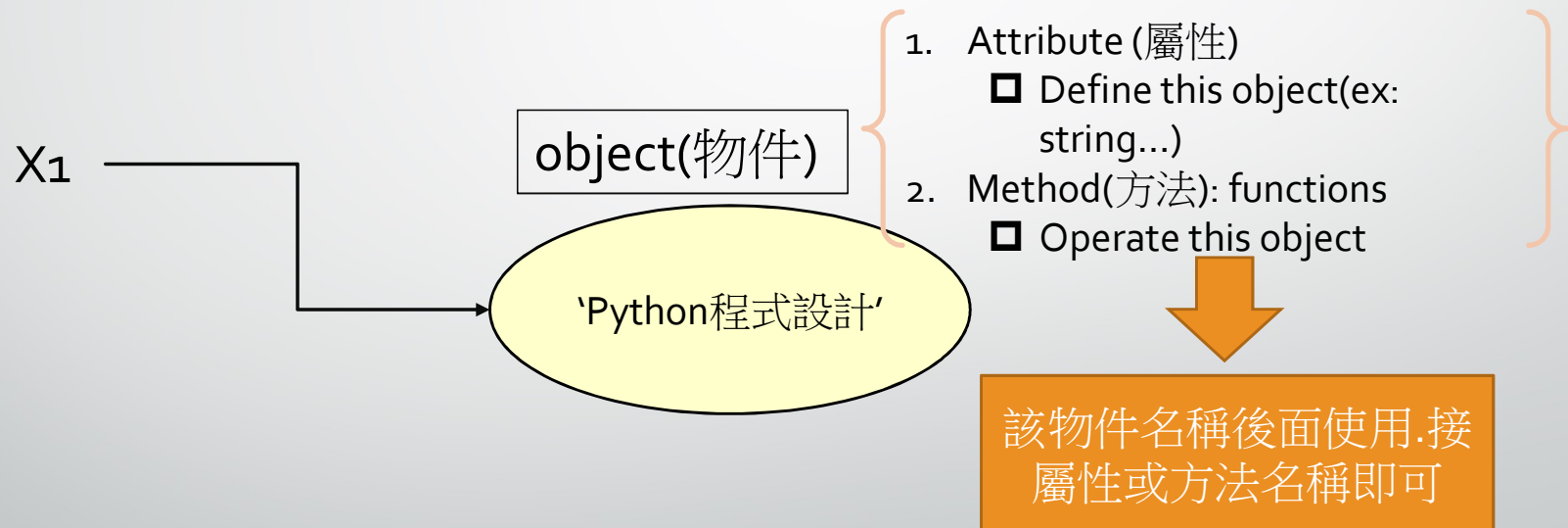


字串進階 -

使用字串類別(class)內提供的函式
(function)

Functions in the string class

X1='Python程式設計'



String conversion method

- `x1='Python程式設計'`
- `print(x1.upper())`: 傳回字串`x1`的所有字元轉換成大寫的字串
- `print(x1.lower())`: 傳回字串`x1`的所有字元轉換成小寫的字串
- `print(x1.swapcase())`: 傳回字串`x1`大小寫互換的字串
- `print(x1.replace(old,new))`: 傳回字串`x1`的`old`字串取代為`new`的字串
- `print(x1.capitalize())`: 傳回字串`x1`的第一個字元轉換成大寫的字元
- `print(x1.title())`: 傳回字串`x1`的每個單字第一個字元轉換成大寫的字元

若 `old` 沒出現在 `x1` ?

針對特定子字串進行操作

- `find()` method: 找出特定子字串，找出字串裡面尋找子字串第一次出現的位置，傳回的結果是第一次出現的索引值，若沒找到則傳回-1
- `rfind()` method: r是reverse，從字串尾段開始搜尋，並傳回第一次出現該子字串出現的索引值
- `str2='me myself and I'`
- `print(str2.find('and'))`
- `print(str2.find('you'))`
- `print(str2.find('e'))`
- `print(str2.rfind('e'))`

How to search for substrings in a string

(字串中搜尋子字串的方法)

```
var1='PythonPythonPythonPython'
print(var1.count('Python')) # number of occurrences of 'Python' in the string var1
print(var1.startswith("Python")) # does the string var1 start with 'Python'?
print(var1.endswith('Python')) # does the string var1 end with 'Python'?
print(var1.find('Python')) #search 'Python' from the beginning of the string var1
print(var1.rfind('Python')) #search 'Python' from the end of the string var1
print(var1.startswith('Python', 0, len(var1)-5 ))
print(var1.endswith('Python', 0, len(var1)-3 )) # advanced example
```

字串內置方法(cont.)

- Provide str.isxxx() function for checking xxx attributes (判斷字串是否有xxx屬性)
 - var='python programming 123'
 - print(var.isdigit()) # 是否全為數字
 - print(var.isalpha()) # 是否全為字母
 - print('var.isalnum()) # 是否全為數字或字母
 - print(var.islower()) # 是否全為小寫
 - print (var.isupper()) # 是否全為大寫
 - print(var.isspace()) # 是否全是空白，是傳回True
 - print(var.istitle()) # 是否每個單字第一個字元都是大寫字元，是傳回True

Return True/False

Practice

- `s1='Today is Friday'`
 1. Does 'day' exist in `s1`?
 2. How many 'day's are in `s1`?
 3. create the new variable *new1* using `replace()` function from `s1`. (*new1* is 'Today is Saturday')

- Python uses **0** as the starting index.
 - string slicing
 - list slicing

Summary

Priority (優先順序表)		
	Operator	Introduction
	[...], (...), {...}	list, set, tuple, dict
high low	a[i], a[i:j]	index(索引)
	a**b	Exponent(指數)
	+a, -a	Positive/negative number (正, 負號)
	a*b, a/b, a//b, a%b	Multiplication, division (乘法, 除法, 餘數...)
	a+b, a-b	Addition, subtraction (加法, 減法)
	<, >, <=, >=, ==, !=	Comparison(比較)
	not a	Not logic
	a and b	And logic
	a or b	or logic



Exercise 2

Question: Q1 and Q2

Q1: Assume the variable *big* references a string (=WORLD). Write a statement that converts the string it references to lowercase, and assigns the converted string to the variable *little*.

Q2: str3="Python language programming"

A. How many 'g's are in str3?

B. Use the search function and print the index of 'p' from str3

Question: Q3

Q3: At a university, each student is assigned a system login name, which the student uses to log into the campus computer system. You will use the following algorithm to generate a login name:

1. *Get the first three characters of the student's first name. (The first name is more than two characters in length)*
2. *Get the first three characters of the student's last name. (The last name is more than two characters in length)*
3. *Get the last three characters of the student's ID number. (If the ID number is more than two characters in length)*
4. *Concatenate the three sets of characters to generate the login name.*
 - *For example, if a **student's name** is Amanda Spencer, and her **ID number** is ENG6721, her login name would be AmaSpe721.*

Question: Q4

Q4: Print these result

s1='HappyNewYear'

s2='happynewyear'

s3='new'

s4='birthday'

- 1: The length of s1 is ?
- 2: Are the lengths of s1 and s2 equal? (Please print False or True)
- 3: Does s3 exist in s1? (Please print False or True)

Review

- Textbook: chapter 9: 9.2