Week 06 - While Loops

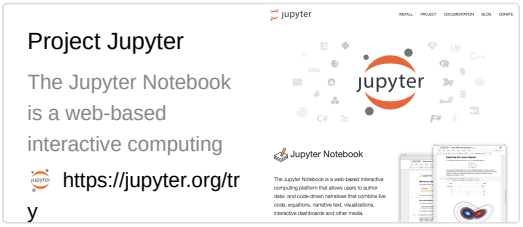
Memo	
Week	6
課程單元	Python 基礎程式設計：While 迴圈

學習目標

- Python 基礎程式設計：while 迴圈 (Lesson 6)
- Sankify 範例解析：Lesson 6

參考資料

- Python 官方網站 (https://www.python.org/)
- Snakify - 線上學習網
- Zuvio - 大學師生互動平台



Python 測試開發工具 https://jupyter.org/try

課程設計

Snakify 線上學習工具 Lesson 6 原理說明

Snakify - Python 3 Interactive Course

while loop repeats the sequence of actions many times until some condition evaluates to False. The condition is given before the loop body and is checked before each execution of the loop body. Typically, the while loop is used when it is

https://snakify.org/en/lessons/while_loop/

While loop

> https://snakify.org/en/lessons/while_loop/

for ... in range(...)

```
p = 6
for i in range(1,10):
    print(f"{p} x {i} = {p*i}")
```

```
6 x 1 = 6
6 x 2 = 12
6 x 3 = 18
6 x 4 = 24
6 x 5 = 30
6 x 6 = 36
6 x 7 = 42
6 x 8 = 48
6 x 9 = 54
```

while ...

```
p = 8
i = 1
while i<10:
    print(f"{p} x {i} = {p*i}")
    i += 1
```

```
8 x 1 = 8
8 x 2 = 16
8 x 3 = 24
8 x 4 = 32
8 x 5 = 40
8 x 6 = 48
8 x 7 = 56
8 x 8 = 64
8 x 9 = 72
```

Count the occurrences of '0' in integers

```
n = int(input())

cnt = 1 if n==0 else 0
while n>0:
    if n%10==0:
        cnt += 1
    n //= 10
print(cnt)
```

```
 101011000000
8
```

Loop control flow: `else`

> One can write an `else`: statement after a loop body which is `executed once` after the end of the loop:

```
i = 1
while i <= 10:
    print(f"{i:2} ", end='')
    i += 1
else:
    print('\nwhile ... ended, i =', i)
```

```
 1  2  3  4  5  6  7  8  9 10
while ... ended, i = 11
```

Loop control flow: else with `break`

```
for i in range(5):
    a = int(input())
    if a < 0:
        print('Met a negative number', a)
else:
    print('No negative numbers met')
```

```
 2
 -2
Met a negative number -2
```

```
for i in range(3):
    a = int(input())
    if a < 0:
        print('Met a negative number', a)
        break
else:
    print('No negative numbers met')
```

```
 2
 -2
Met a negative number -2
```

Black Jack-like example

> a program that reads numbers and sums it until the total gets `greater or equal to 21`. The input sequence `ends with 0` for the program to be able to stop even if the total sum of all numbers is less than 21.

```
total = 0
a = int(input())
while a != 0:
    total += a
    if total >= 21:
        print('Total sum is', total)
        break
    a = int(input())
else:
    print('Total sum is less than 21 and is equal to', total, '.')
```

```
 9
 8
 3
 0
Total sum is less than 21 and is equal to 20 .
```

```
 13
 9
Total sum is 22
```

Loop control flow: `continue`

```
for i in range(100):
    if i%10==0:
        print()
    print(f"{i:4}",end='')
```

```
  0   1   2   3   4   5   6   7   8   9
 10  11  12  13  14  15  16  17  18  19
 20  21  22  23  24  25  26  27  28  29
 30  31  32  33  34  35  36  37  38  39
 40  41  42  43  44  45  46  47  48  49
 50  51  52  53  54  55  56  57  58  59
 60  61  62  63  64  65  66  67  68  69
 70  71  72  73  74  75  76  77  78  79
 80  81  82  83  84  85  86  87  88  89
 90  91  92  93  94  95  96  97  98  99
```

```
for i in range(100):
    if i%10==0:
        print()
    if i%2==0 or i%3==0 or i%5==0:
        continue
    print(f"{i:4}",end='')
```

```
  1   7
 11  13  17  19
 23  29
 31  37
 41  43  47  49
 53  59
 61  67
 71  73  77  79
 83  89
 91  97
```

`break` and `continue` placed inside nested loops

```
for i in range(3):
    for j in range(5):
        if j > i:
            break
        print(i, j)
```

```
0 0
1 0
1 1
2 0
2 1
2 2
```

```
for i in range(3):
    for j in range(5):
        if j == i:
            break
        print(i, j)
```

```
1 0
2 0
2 1
```

```
for i in range(3):
    for j in range(5):
        if j == i:
            continue
        print(i, j)
```

```
0 1
0 2
0 3
0 4
1 0
1 2
1 3
1 4
2 0
2 1
2 3
2 4
```

Multiple assignment

```
a, b, c = 1, 2, 3
x, y, z = [4, 5, 6]
print(f"a = {a}, b = {b}, c = {c}")
print(f"x = {x}, y = {y}, z = {z}")
```

```
a = 1, b = 2, c = 3
x = 4, y = 5, z = 6
```

Swap variables

```
a = 666
b = 777
print(f"a = {a}, b = {b}")
c = a
a = b
b = c
print(f"a = {a}, b = {b}")
```

```
a = 666, b = 777
a = 777, b = 666
```

```
a = 666
b = 777
print(f"a = {a}, b = {b}")
a, b = b, a
print(f"a = {a}, b = {b}")
```

```
a = 666, b = 777
a = 777, b = 666
```

Rotate variables

```
a, b, c, d, e = range(5)
for i in range(5):
    print(a,b,c,d,e)
    a, b, c, d, e = e, a, b, c, d
```

```
0 1 2 3 4
4 0 1 2 3
3 4 0 1 2
2 3 4 0 1
1 2 3 4 0
```

想看看，不使用『Multiple assignment』程式要如何撰寫？

Snakify 範例解析 - The average of the sequence

> https://snakify.org/en/lessons/while_loop/problems/seq_avg/

✏️ Determine the average of all elements of the sequence ending with the number 0.

```
total, cnt = 0, 0
a = int(input())
while a!=0:
    total += a
    cnt += 1
    a = int(input())
print(total/cnt)
```

Snakify 範例解析 - The index of the maximum of a sequence

> https://snakify.org/en/lessons/while_loop/problems/seq_index_of_max/

✏️ A sequence consists of integer numbers and `ends with the number 0.` Determine `the index of the largest element` of the sequence. If the highest element is not unique, print the index of `the first of them`.

```
a = int(input())
iMax, i, aMax = 1, 1, 0
while a!=0:
    if a>aMax:
        iMax, aMax = i, a
    i, a = i+1, int(input())
print(iMax)
```

想看看，如果要找的是『最後一個』最大值呢？

Snakify 範例解析 - The number of elements that are greater than the previous one

> https://snakify.org/en/lessons/while_loop/problems/seq_increasing_neighbours/

✏️ A sequence consists of integer numbers and ends with the number 0. Determine how many elements of this sequence are greater than their neighbors above.

```
a = int(input())
cnt = 0
while a!=0:
    b = int(input())
    if b>a:
        cnt += 1
    a = b
print(cnt)
```

Snakify 範例解析 - The number of elements that are greater than the previous one

> https://snakify.org/en/lessons/while_loop/problems/seq_second_max/

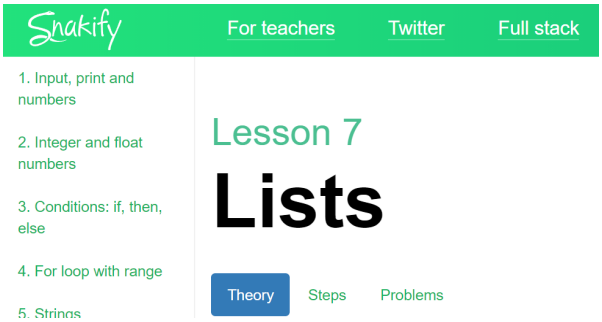
✏️ The sequence consists of `distinct` positive integer numbers and ends with the number 0. Determine the value of `the second largest element` in this sequence. It is guaranteed that the sequence has `at least two elements`.

```
a, b = int(input()), int(input())
c = b;
if a>b:
    a, b = b, a
while c!=0:
    c = int(input())
    if c>b:
        a, b = b, c
    elif c>a:
        a = c
print(a)
```

課堂作業

Homework 01 - Snakify Python 程式問題練習。 **驗收期限：期中考前一週 (10/31)。**

- 請完成 Lesson 7 中的所有題目。
- 請務必先註冊且登入你的 Snakify 帳號。



https://snakify.org/en/lessons/lists/