

Loop 2

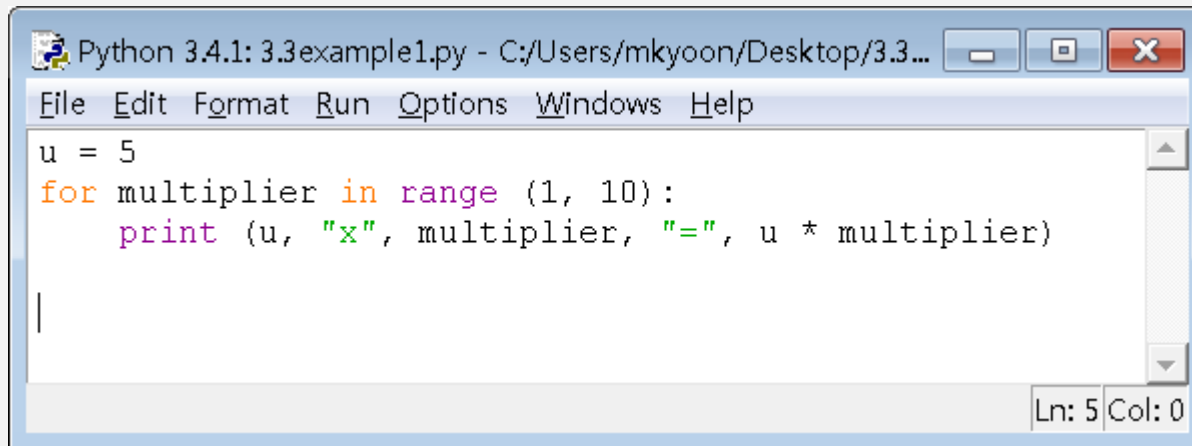
국민대학교 소프트웨어학부

수업목표

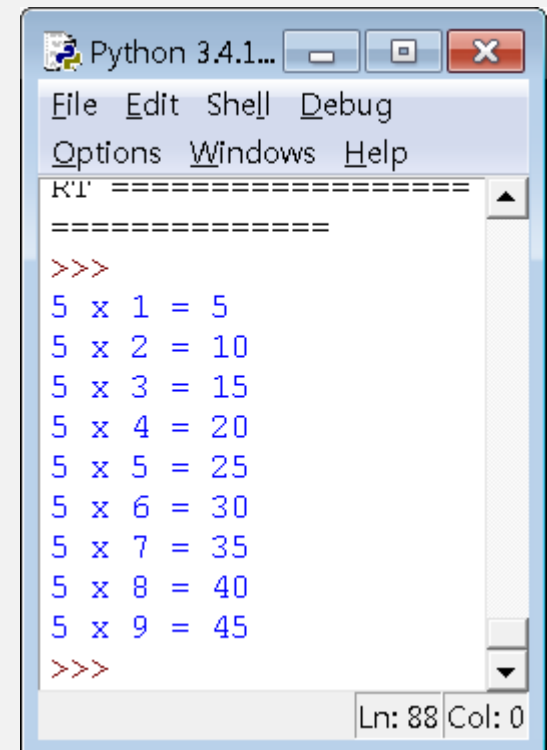
- What is a nested loop
- Variable loops
- Variable nested loops
- Examples

What is a nested loop

- 곱셈표 출력
 - 5단 출력: for loop 하나면 해결



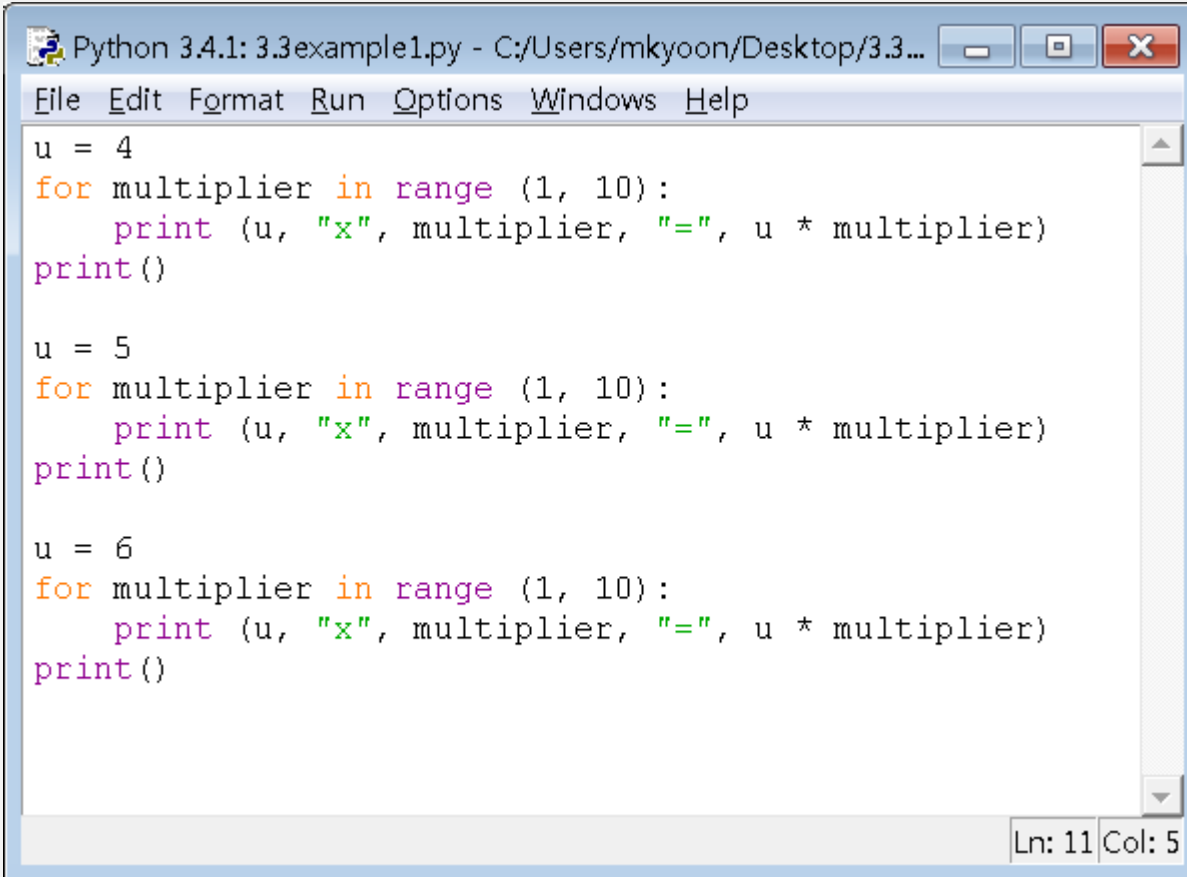
```
Python 3.4.1: 3.3example1.py - C:/Users/mkyoon/Desktop/3.3...  
File Edit Format Run Options Windows Help  
u = 5  
for multiplier in range (1, 10):  
    print (u, "x", multiplier, "=", u * multiplier)  
|  
Ln: 5 Col: 0
```



```
Python 3.4.1...  
File Edit Shell Debug  
Options Windows Help  
K'I =====  
=====  
>>>  
5 x 1 = 5  
5 x 2 = 10  
5 x 3 = 15  
5 x 4 = 20  
5 x 5 = 25  
5 x 6 = 30  
5 x 7 = 35  
5 x 8 = 40  
5 x 9 = 45  
>>>  
Ln: 88 Col: 0
```

What is a nested loop

- 곱셈표 출력
 - 4단부터 6단까지 출력: 세 개의 for loop으로 해결 → bad idea! Why?



```
Python 3.4.1: 3.3example1.py - C:/Users/mkyoon/Desktop/3.3...
File Edit Format Run Options Windows Help

u = 4
for multiplier in range (1, 10):
    print (u, "x", multiplier, "=", u * multiplier)
print()

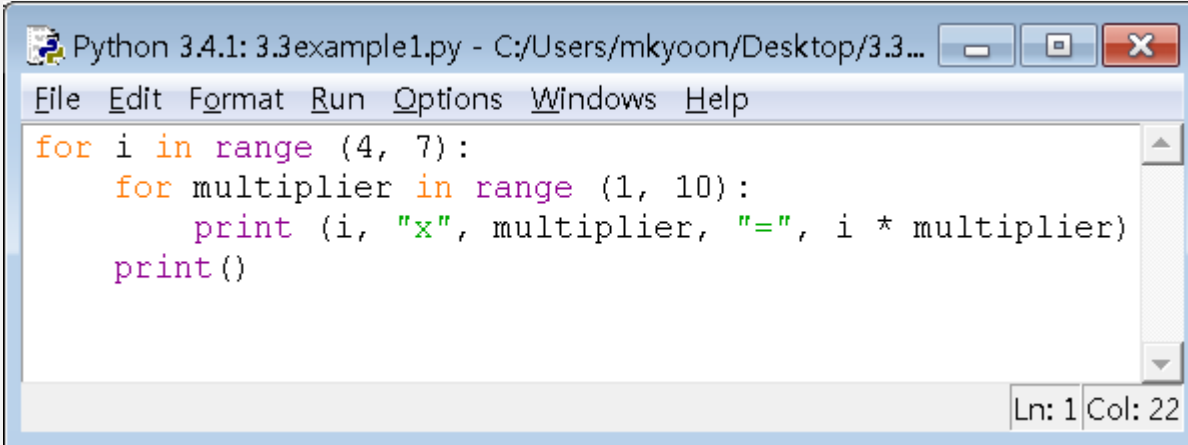
u = 5
for multiplier in range (1, 10):
    print (u, "x", multiplier, "=", u * multiplier)
print()

u = 6
for multiplier in range (1, 10):
    print (u, "x", multiplier, "=", u * multiplier)
print()

Ln: 11 Col: 5
```

What is a nested loop

- 곱셈표 출력
 - 4단부터 6단까지 출력: 이중 for loop으로 해결!

A screenshot of a Python 3.4.1 IDE window. The title bar reads "Python 3.4.1: 3.3example1.py - C:/Users/mkyoon/Desktop/3.3...". The menu bar includes "File", "Edit", "Format", "Run", "Options", "Windows", and "Help". The code editor contains the following Python code:

```
for i in range (4, 7):  
    for multiplier in range (1, 10):  
        print (i, "x", multiplier, "=", i * multiplier)  
    print()
```

The status bar at the bottom right shows "Ln: 1 Col: 22".

```
Python 3.4.1: 3.3example1.py - C:/Users/mkyoon/Desktop/3.3...  
File Edit Format Run Options Windows Help  
for i in range (4, 7):  
    for multiplier in range (1, 10):  
        print (i, "x", multiplier, "=", i * multiplier)  
    print()  
Ln: 1 Col: 22
```

What is a nested loop

- 곱셈표 출력
 - 4단부터 6단까지 출력: 이중 for loop으로 해결!

```
for i in range(4, 7):  
    print("{}단".format(i))  
    for j in range(1, 10):  
        print("{} x {} = {}".format(i, j, i*j))
```

What is a nested loop

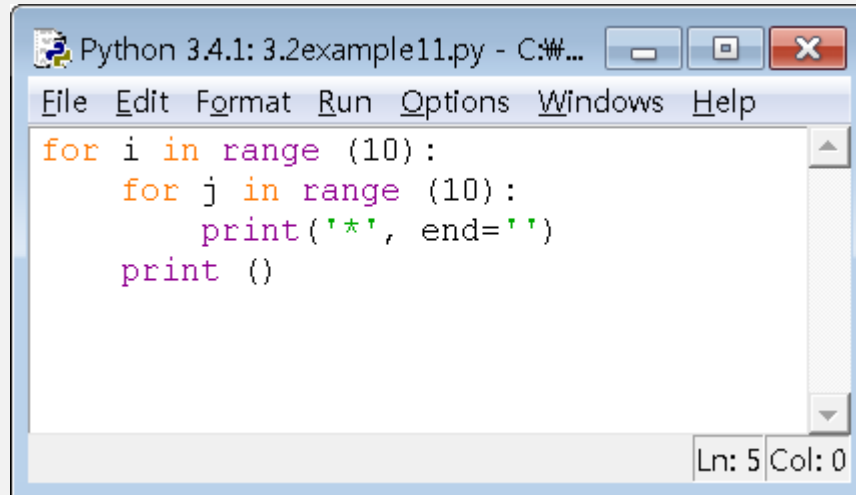
- Nested for loop
 - 문법

```
for iterating_var in sequence:  
    for iterating_var in sequence:  
        statements(s)  
statements(s)
```

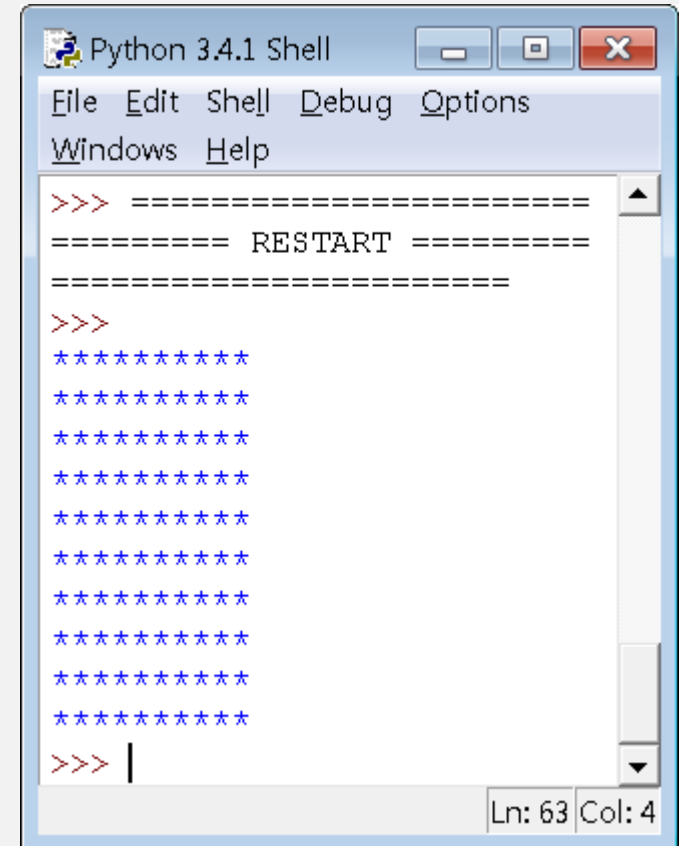
http://www.tutorialspoint.com/python/python_nested_loops.htm

What is a nested loop

- Nested for loop



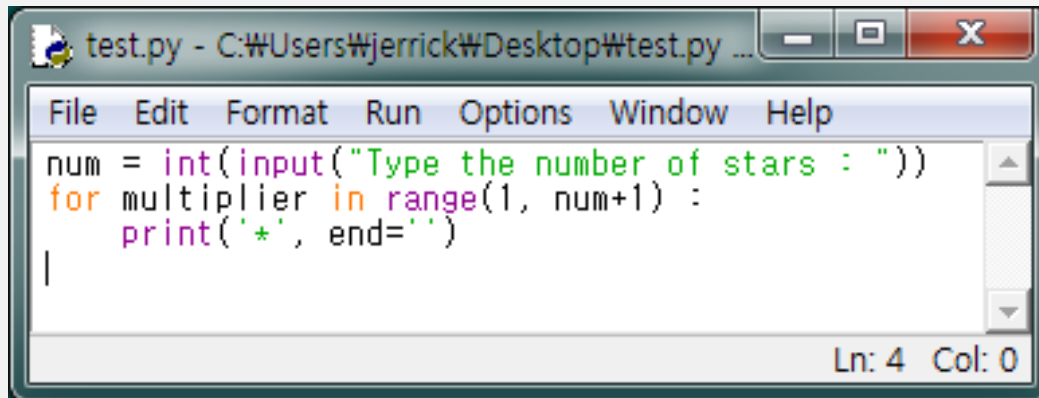
```
Python 3.4.1: 3.2example11.py - C:\#...
File Edit Format Run Options Windows Help
for i in range (10):
    for j in range (10):
        print('*', end='')
    print ()
Ln: 5 Col: 0
```



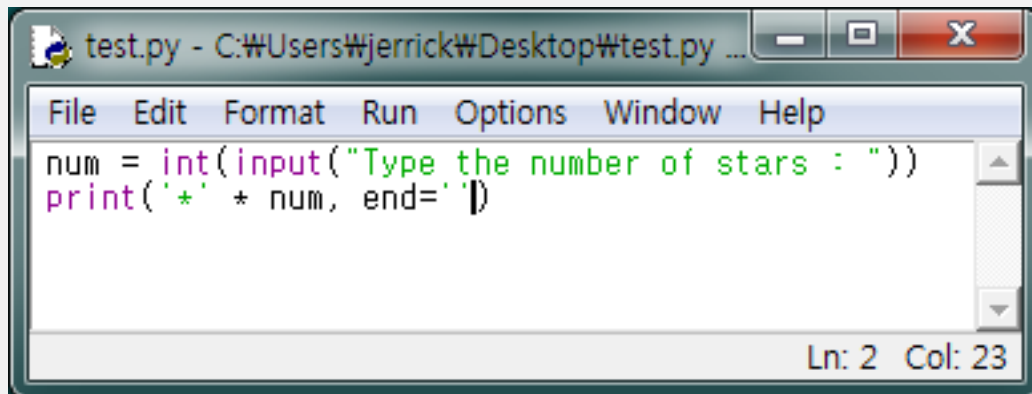
```
Python 3.4.1 Shell
File Edit Shell Debug Options
Windows Help
>>> =====
===== RESTART =====
>>>
*****
*****
*****
*****
*****
*****
*****
*****
*****
*****
>>> |
Ln: 63 Col: 4
```


Variable loops

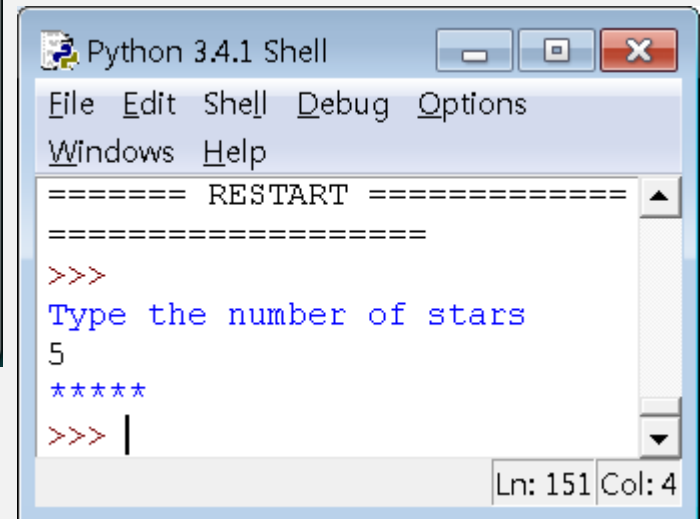
- 반복횟수가 가변적인 상황
 - Ex) 입력된 횟수만큼 별표 출력



```
test.py - C:\Users\jerrick\Desktop\test.py ...
File Edit Format Run Options Window Help
num = int(input("Type the number of stars : "))
for multiplier in range(1, num+1) :
    print('*', end='')
|
Ln: 4 Col: 0
```



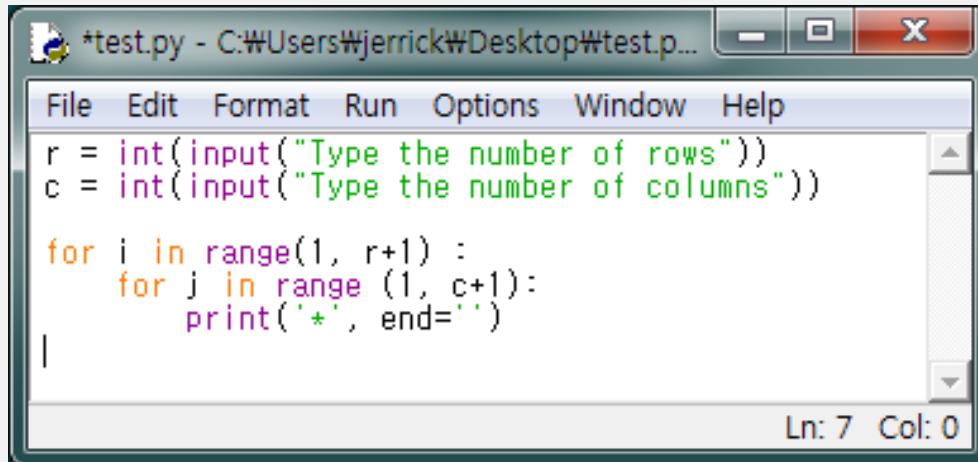
```
test.py - C:\Users\jerrick\Desktop\test.py ...
File Edit Format Run Options Window Help
num = int(input("Type the number of stars : "))
print('*' * num, end='')
Ln: 2 Col: 23
```



```
Python 3.4.1 Shell
File Edit Shell Debug Options
Windows Help
===== RESTART =====
=====
>>>
Type the number of stars
5
*****
>>> |
Ln: 151 Col: 4
```

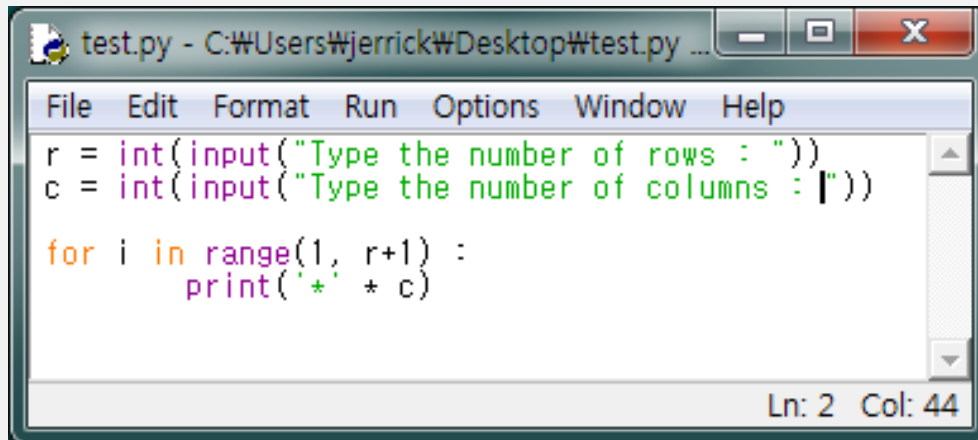
Variable nested loops

- 반복횟수가 가변적인 상황
 - Ex) 입력된 횟수만큼 별표 출력



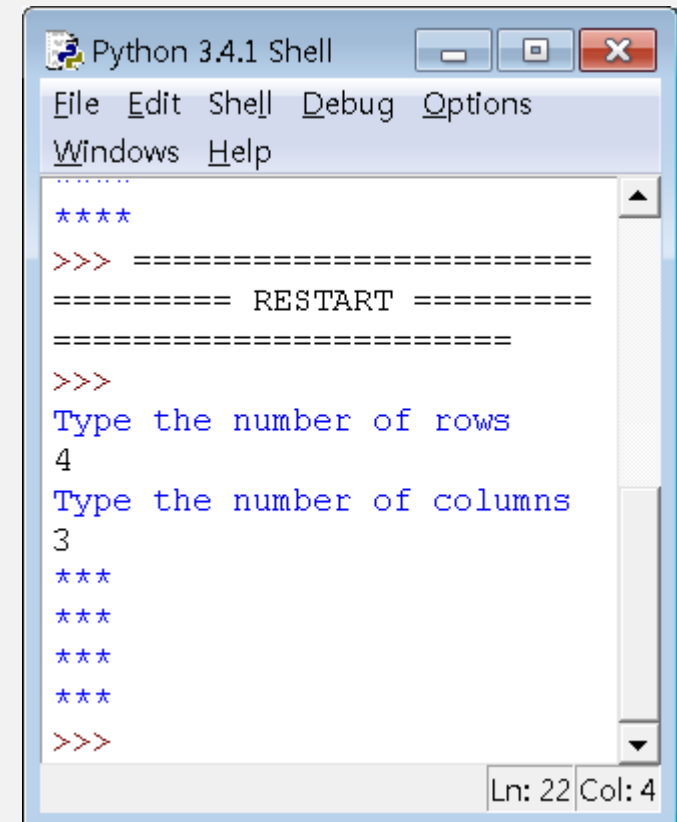
```
*test.py - C:\Users\Wjerrick\Desktop\test.p...
File Edit Format Run Options Window Help
r = int(input("Type the number of rows"))
c = int(input("Type the number of columns"))

for i in range(1, r+1) :
    for j in range(1, c+1):
        print('*', end='')
|
Ln: 7 Col: 0
```



```
test.py - C:\Users\Wjerrick\Desktop\test.py ...
File Edit Format Run Options Window Help
r = int(input("Type the number of rows : "))
c = int(input("Type the number of columns : "))

for i in range(1, r+1) :
    print('*', * c)
Ln: 2 Col: 44
```



```
Python 3.4.1 Shell
File Edit Shell Debug Options
Windows Help
>>> *****
>>> ===== RESTART =====
>>>
Type the number of rows
4
Type the number of columns
3
***
***
***
***
>>>
Ln: 22 Col: 4
```

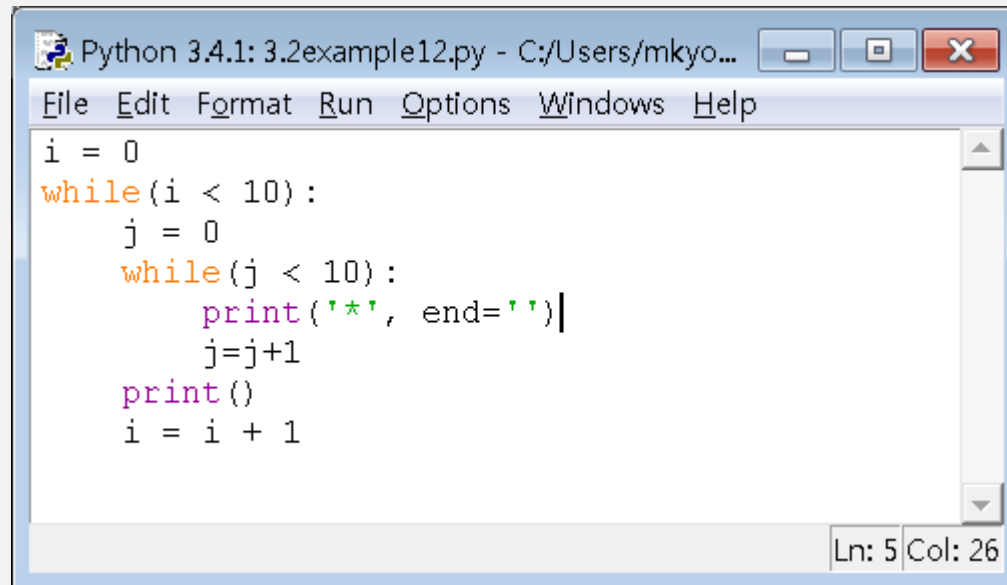
Nested loop

- Nested while loop

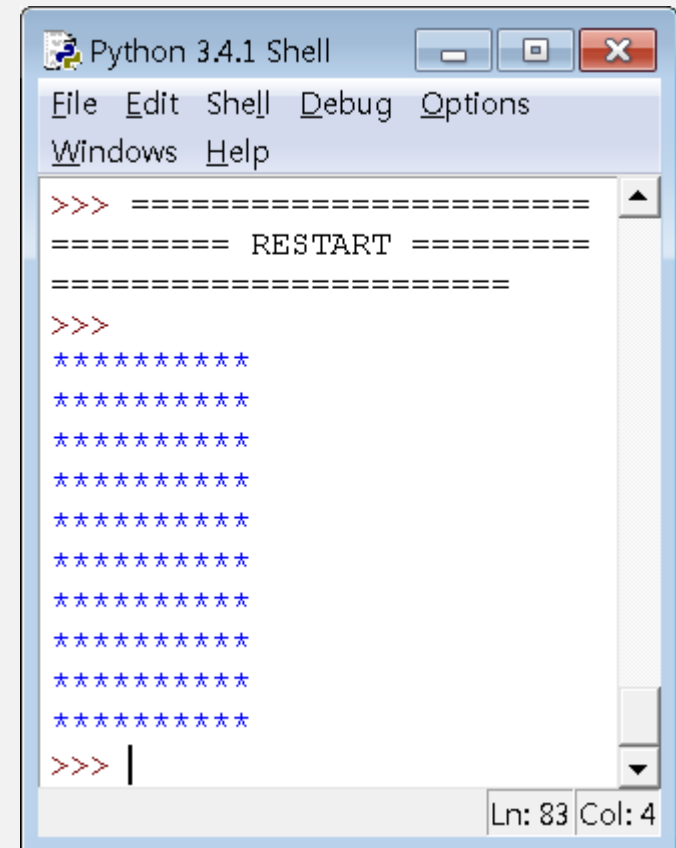
```
while expression:  
    while expression:  
        statement(s)  
    statement(s)
```

Nested loop

- Nested while loop



```
Python 3.4.1: 3.2example12.py - C:/Users/mkyo...
File Edit Format Run Options Windows Help
i = 0
while(i < 10):
    j = 0
    while(j < 10):
        print('*', end='')
        j=j+1
    print()
    i = i + 1
Ln: 5 Col: 26
```



```
Python 3.4.1 Shell
File Edit Shell Debug Options
Windows Help
>>> =====
===== RESTART =====
>>>
*****
*****
*****
*****
*****
*****
*****
*****
*****
*****
>>> |
Ln: 83 Col: 4
```

실습

- 구구단 출력
- For loop을 while loop으로 전환

실습

- '*' 삼각형 출력
- 주어진 n 에 따라 높이가 n 인 직각 삼각형 출력

– $n=3$

*

**

– $n=5$

*

**

실습

- '*' 삼각형 출력
- 주어진 n에 따라 높이가 n인 직각 삼각형 출력

```
n = int(input("n > "))  
  
for i in range(n):  
    for j in range(i + 1):  
        print("*", end="")  
    print()
```

실습

- 자연수 n 을 입력 받고, 다음과 같이 첫 번째 줄에는 '*'을 1개, 둘째 줄에는 2개 n 번째 줄에는 n 개를 출력하는 파이썬 코드를 작성하세요.

```
n > 5
*
**
***
****
*****
```


실습

- 자연수 n 을 입력 받고, 다음과 같이 첫 번째 줄에는 '*'을 1개, 둘째 줄에는 2개 n 번째 줄에는 n 개를 출력하는 파이썬 코드를 작성하세요.

```
n = int(input("n > "))

for i in range(n):
    for j in range(n - i - 1):
        print(end = ' ')
    for j in range(i + 1):
        print("*", end="")
    print()
```

숙제

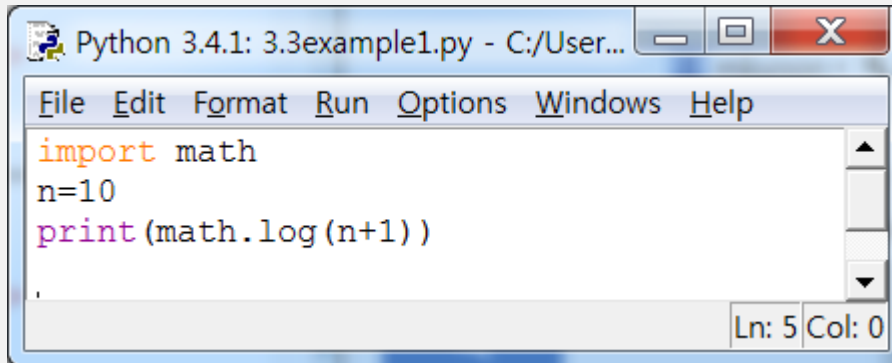
- 자연수 n 을 입력 받고, 다음과 같은 모양을 출력하시오. 첫 번째 줄에는 '*'을 1개, n 번째 줄에는 $(2*n-1)$ 개를 출력하는 파이썬 코드를 작성하세요.

```
n > 5
*
***
*****
*****
*****
```

숙제

- 조화급수와 로그

- 조화급수는 다음과 같이 정의된다.
 - $1/1 + 1/2 + 1/3 + 1/4 + \dots$
- n번째 항까지의 조화급수는 $(1/1 + 1/2 + 1/3 + 1/4 + \dots + 1/n)$ 이다.
- 아래 그림(n=5)과 같이, n번째 항까지의 조화급수는 $\int_1^{n+1} \frac{1}{x} dx$ 와 거의 같아지므로, $\ln(n+1)$ 로 계산될 수 있다.
- k=[1..100] 범위에서 실제 조화급수의 값과 $\ln(n+1)$ 로 측정한 값을 출력하고, 오차율($(\text{측정값} - \text{실제값}) / \text{실제값}$)도 출력하시오.
 - $\ln(n+1)$ 을 계산하려면 `import math`가 필요



```
Python 3.4.1: 3.3example1.py - C:/User...
File Edit Format Run Options Windows Help
import math
n=10
print(math.log(n+1))
Ln: 5 Col: 0
```

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