

NESTED LOOPS

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- A nested loop is a loop within the body of another loop
- This is probably best explained with an example
 - In code snippets like this one we refer to the loop that is within the other loop as **the inner loop**

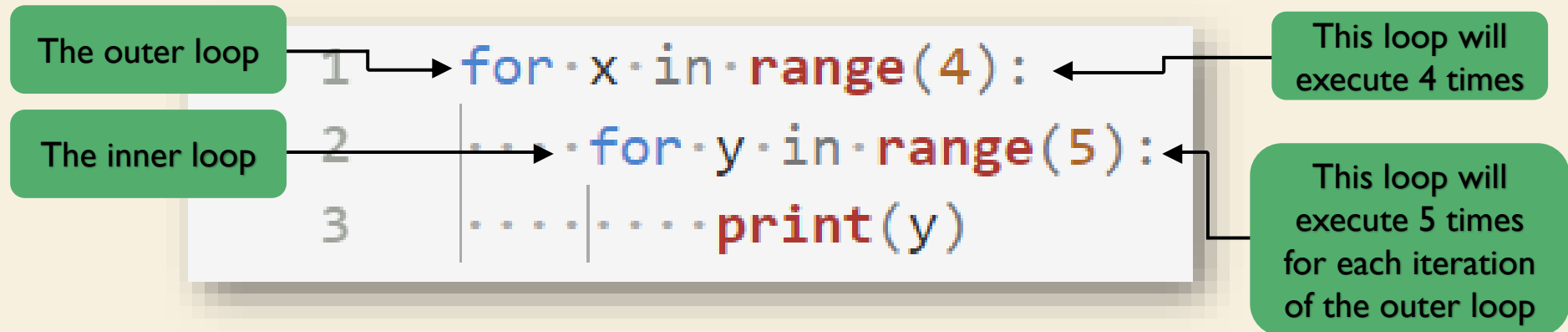
The outer loop

```
1 → for x in range(4):
```

The inner loop

```
2 → ... for y in range(5):  
3     ... print(y)
```

NESTED LOOPS



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1

x starts with the value 0. While x is 0 the inner loops executes and y is printed 5 times. The numbers: 0,1,2,3,4 will be printed.

2

The inner loops is done! So now the second iteration of the outer loop can begin. x gets the value 1. While x is 1 the inner loops executes and y is printed 5 times. The numbers: 0,1,2,3,4 will be printed.

3

The inner loop is done again! So now the third iteration of the outer loop can begin. x gets the value 2. While x is 2 the inner loops executes and y is printed 5 times. The numbers: 0,1,2,3,4 will be printed.

4

The inner loop is done again! So now the fourth iteration of the outer loop can begin. x gets the value 3. While x is 3 the inner loops executes and y is printed 5 times. The numbers: 0,1,2,3,4 will be printed. Once the inner loops is done the outer loop finishes because now it has executed 4 times.

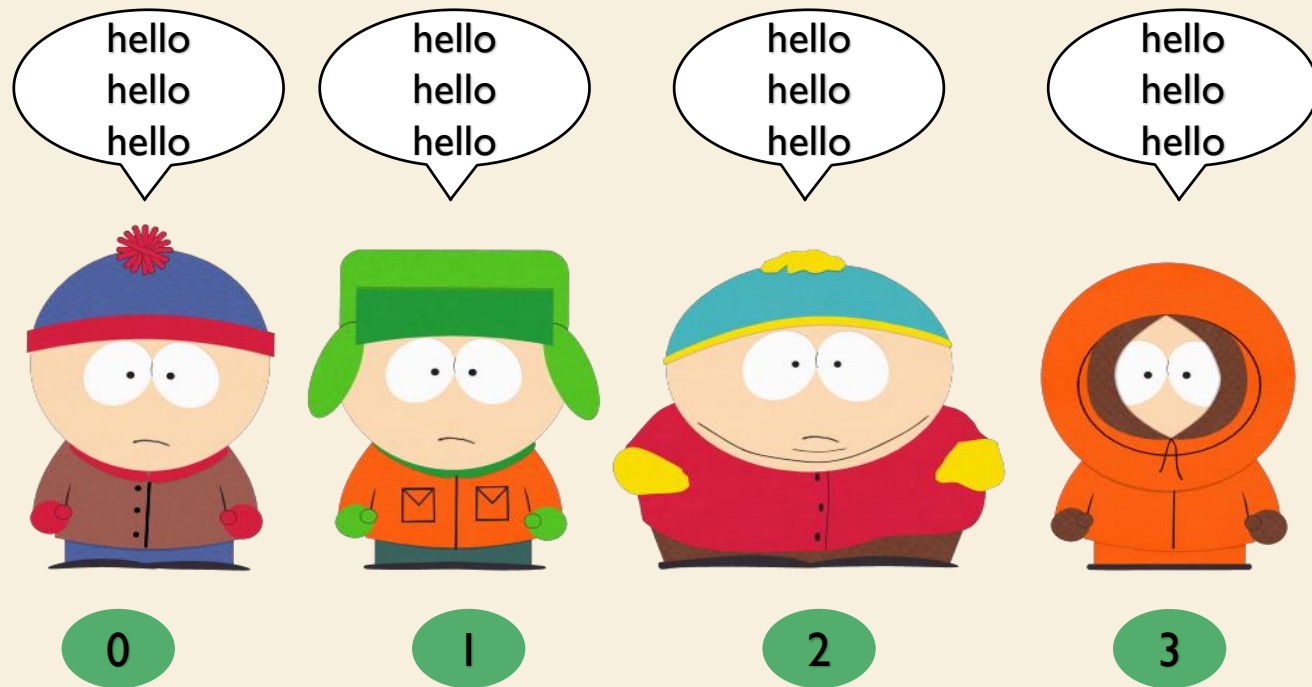
```
1  for x in range(4):  
2      |...for y in range(5):  
3      |...|...print(y)
```

NESTED LOOPS

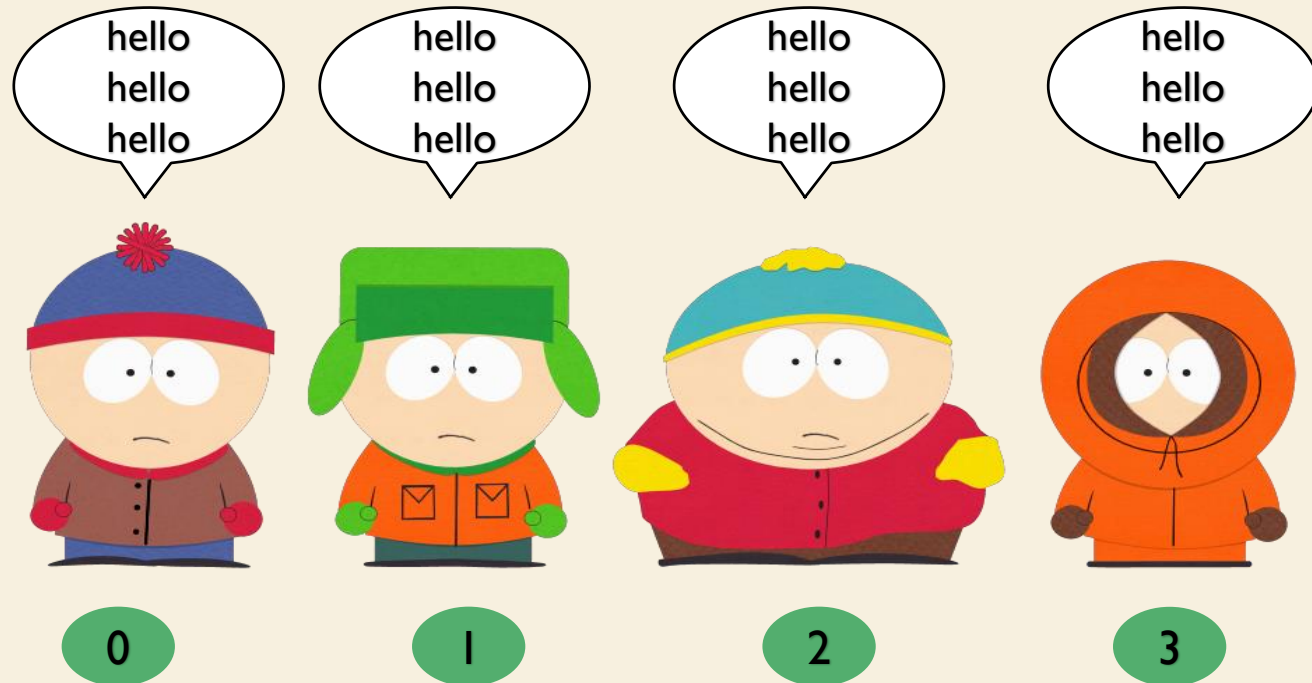
- A real life simulation might be 4 kids in a row
 - Each kid has a number, the first one gets the number 0 (becuase we love computers and computers start counting at zero), the second kid gets the numbers 1 and so on ...
 - Each kid, one at a time has to say hello three times
 - So you could think of this like a nested loop
 - The outer loops walks from the first kid to the last one
 - The inner loops says hello three times for each kid

NESTED LOOPS

- Here is a visual representation



NESTED LOOPS



Here is a code snippet that represents the picture

```
1  for person_number in range(4):
2      print("person", person_number, "says: ")
3      for x in range(3):
4          print("...", "hello")
```

NESTED LOOPS

- You can think of it like this:
 - For each person(i.e person_number) hello is printed 3 times
 - Each person is represented with the outer loop
 - The text hello printed 3 times for each person is the inner loop

```
1  for person_number in range(4):
2      ... print("person", person_number, "says: ")
3      ... for x in range(3):
4          ... | ... print("....", "hello")
```


NESTED LOOPS

- Here are some examples that I recommend trying out to get a good feeling for nested loops

```
1  for x in range(4):  
2  |    for y in range(5):  
3  |    |    print("outer: ", x, "inner: ", y)
```

```
1  for x in range(5):  
2  |    for y in range(x):  
3  |    |    print(y)
```

```
1  for x in range(5):  
2  |    for y in range(x):  
3  |    |    print(y, end=" ")  
4  |    print()
```

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```
1  for x in range(5):  
2      | .....for y in range(x*2):  
3      | .....| .....print(y, end=" ")  
4      | .....print()
```

```
1  for x in range(4):  
2      | .....print("outer is:", x)  
3      | .....print("inner is: ", end=" ")  
4      | .....for y in range(5):  
5      | .....| .....print(y, end=" ")  
6      | .....print()
```

NESTED LOOP

- Try these code snippets out on your own computers and try coming up with your own nested loops
 - Make sure you understand what the code is doing 😊
- We will revisit the nested loops when we cover lists

