

Nested For Loops

Textbook

Nested For Loops



Nested for loops are when you use a for loop inside of another for loop. This is what we did in a previous lesson to create a 1D list. Here's that code again:

```
1 n = 5
2 list = []
3 for i in range(n):
4     list.append(i)
5 print(list)
6
```

Try it!

To create a 2D list, we used this code:

```
1 rows = 5
```

```

2 cols = 5
3 list = []
4 for i in range(cols):
5     col = []
6     for j in range(rows):
7         col.append(j)
8     list.append(col)
9 print(list)

```

Try it!

Let's walk through this code.

We have two lists—one named `rows` and one named `cols`.

We also have an empty list named `list`.

The code `for i in rows:` says that we are going to go through the variable named `rows`, one at a time. So we start with the `1`. But what do we do with the `1`? Let's look inside the first for loop.

Inside the first for loop we have an empty list named `col = []`. And then inside the first for loop we have another loop! This is called a **nested for loop** and we will talk more about this in the next lesson. It means for each item in the list named `rows`, we will do another loop!

So remember that we are still working on our first loop for the `1` in the list named `rows`. For just that `1`, we are looping through all five values in the list named `cols`. What are we doing when we loop through the list named `cols`? We are appending a value of `j`. The value of `j` is whichever value in the list named `cols` that we are currently on.

That sounds complex, but for that first value in the list named `rows`, we end up with another list:

```
["red", "orange", "yellow", "green"]
```

This list then gets appended to the empty list named `list`.

Then we do the whole loop again starting with the value of `2` in the list named `rows`. So by the end we end up with three rows of values.

```
["red", "orange", "yellow", "green"]
```

```
["red", "orange", "yellow", "green"]
```

```
["red", "orange", "yellow", "green"]
```

On your screen, each of these lists is in a bigger list. So it looks like this:

```
[["red", "orange", "yellow", "green"], ["red", "orange", "yellow", "green"], ["red", "orange", "yellow", "green"]]
```

One Line For Loops

Python has a useful ability to allow us to write a for loop that only takes up one line! This is useful when creating lists. It helps our code be more simple and easy to read. We can create a list using just this one line of code:

```

1 list = ["hello" for i in range(5)]
2 print(list)

```

Try it!

This will create a list 5 indexes long, with "hello" as the value in all the indexes.

We can also create one line nested for loops to create multi-dimensional lists! This code below will create a 2D list:

```
1 rows = 3
2 my_list = [1, 2, 3, 4, 5]
3 list = [[j for j in my_list] for i in range(rows)]
4
5 print(list)
```

Try it!

Checkpoint

Nested For Loops

1. Write a program that uses a one line nested for loop to get a 2D list.
2. The list will have **3 rows and 5 columns**.
3. Create a variable named `rows` and assign it to the number of rows you need.
4. Create a variable named `pets` and assign it to a list with 5 strings in it.
5. Create a one line nested for loop that first loops through the list named `pets` , then repeats that loop for each value in the range of the value of `rows`.
6. Print that list.

Requirements:

- Create a variable named `rows` and assign it to the number of rows you need.
- Create a variable named `pets` and assign it to a list with 5 strings in it.
- Create a one line nested for loop that first loops through the list named `pets` , then repeats that loop for each value in the range of the value of `rows`.
- Print the 2D list.

Questions (5)

1. What is the term used when we put a for loop inside of another for loop?

MULTIPLE CHOICE

Choose the correct answer:

- A. Stacking
- B. Nesting
- C. Aligning
- D. Listing

2. True or False: You can create for loops in just one line of code.**Choose the correct answer:**

- A. True
- B. False

3. What is a nested for loop?**Choose the correct answer:**

- A. A loop that only has one iteration
- B. A loop that uses the "for" keyword only once
- C. A loop inside another loop
- D. A loop that doesn't use any conditions

4. What is the outcome of the code snippet?

```
list = ["hello" for i in range(5)] print(list)
```

Choose the correct answer:

- A. It creates a 5-item list with "hello" in all indexes
- B. It prints "hello" 5 times
- C. It creates a list with a single item "hello"
- D. It creates an empty list

5. In the following example, how many times will the inner loop run?

```
rows = 3 my_list = [1, 2, 3, 4, 5] list = [[j for j in my_list] for i in range(rows)] print(list)
```

Choose the correct answer:

- A. 1
- B. 3
- C. 5
- D. 15

Challenges (2)

1. Multiply by the Number of Rows

Practice using nested for loops!

Consider the following list.

```
mylist = [1, 2, 3, 4, 5]
```

Write a program that asks the user how many rows they want. The program then creates a 2D list with that many rows. Each number in the list named `mylist` will be multiplied by the number of rows.

For example:

Input: `3`

Output: `[[3, 6, 9, 12, 15], [3, 6, 9, 12, 15], [3, 6, 9, 12, 15]]`

2. Weather Watcher

Think of the different kinds of weather—**snow, rain, fog, hail, sunny**. Each of these kinds of weather can also have a kind of wind speed to them—**windy, breezy, calm, stormy**. You realize you can create a Python program to combine these kinds of weather with the wind speeds.

1. Create a program that takes in a list of weather from the user.
2. Now create a 2D list with the input and this list of wind speeds.

```
cols = ["windy", "breezy", "calm"]
```

3. Using the inputted list and the wind speed list, generate a 2D list.

For example:

Input: `sun rain snow`

Output: `[['sun windy', 'sun breezy', 'sun calm'], ['rain windy', 'rain breezy', 'rain calm'], ['snow windy', 'snow breezy', 'snow calm']]`

Hint: This is how to create a list from an input.

```
rows = input("Input a list of weather").split()
```

Answer Keys & Solutions

Checkpoint Solutions

Nested For Loops

```
1 rows = 3
2 pets = ["dog", "cat", "cow", "sheep", "bird"]
3 list = [[j for j in pets] for i in range(rows)]
4
5 print(list)
```

Questions

1. What is the term used when we put a for loop inside of another for loop?

MULTIPLE CHOICE

Correct Answer:

- A. Stacking ✗ Incorrect
- B. Nesting ✓ Correct
- C. Aligning ✗ Incorrect
- D. Listing ✗ Incorrect

Explanation:

This term alludes to the round nature of loops.

2. True or False: You can create for loops in just one line of code.

MULTIPLE CHOICE

Correct Answer:

- A. True ✓ Correct
- B. False ✗ Incorrect

Explanation:

Here is an example: `list = [0 for i in range(5)]`

3. What is a nested for loop?

MULTIPLE CHOICE

Correct Answer:

- A. A loop that only has one iteration ✗ Incorrect
- B. A loop that uses the "for" keyword only once ✗ Incorrect
- C. A loop inside another loop ✓ Correct
- D. A loop that doesn't use any conditions ✗ Incorrect

Explanation:

The loops "nest" inside each other

4. What is the outcome of the code snippet?

MULTIPLE CHOICE

Correct Answer:

- A. It creates a 5-item list with "hello" in all indexes ✓ Correct
- B. It prints "hello" 5 times ✗ Incorrect
- C. It creates a list with a single item "hello" ✗ Incorrect
- D. It creates an empty list ✗ Incorrect

Explanation:

For each item in a range of 1-5, it will replace the word "hello"

5. In the following example, how many times will the inner loop run?

MULTIPLE CHOICE

Correct Answer:

- A. 1 ✗ Incorrect
- B. 3 ✗ Incorrect
- C. 5 ✗ Incorrect
- D. 15 ✓ Correct

Explanation:

The inner loop will run for each item in my_list 3 times

Challenges

1. Multiply by the Number of Rows

Solution:

```
1 rows = int(input("How many rows do you want?"))
2 mylist = [1, 2, 3, 4, 5]
3 list = [(j*rows) for j in mylist] for i in range(rows)]
4
5 print(list)
```

2. Weather Watcher

Solution:

```
1 rows = input("Input a list of weather").split()
2 cols = ["windy", "breezy", "calm"]
3 list = [(i + " " + j) for j in cols] for i in rows]
4 print(list)
```