Indentation, Comments & Docstrings Scope and Rules

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01

Indentation

Indentation – Before We Begin

Python

```
if True:
----print("This is indented and part of the if block.")
print("This is not indented and outside the if block.")
```

Indentation

- Indentation in Python is one of the most **critical** aspects of the language.
- Indentation refers to the **spaces** at the beginning of a line of code.
- In Python, indentation is used to determine the **grouping of statements**, which is essential for defining the structure of your code.
- Python does not enforce a **specific number** of spaces for indentation, but it must be consistent within a block of code.
- You typically indent after keywords like **if, for, while, def, and class**.

Indentation Levels/ Depth

Python

```
if True:
----if True:
--------for i in range(5):
------------print(i)
--------pass
----pass
```

Common Mistakes with Indentation

1. Inconsistent Indentation

Python

```
if True:
    print("This is fine.")
  print("This is not fine.") # This will cause an IndentationError
```

Correct Way

```
if True:
    print("This is fine.")
print("This is not fine.") # This will be smooth
```

Common Mistakes with Indentation

2. Missing Indentation

Python

```python
if True:
print("This is not fine.") # This will cause an IndentationError
```

Correct Way

```python
if True:
    print("This is fine.") # This will be smooth
```

02

Comments & Docstrings

Comments

Comments are text in your code that is **NOT executed** by Python. They are used to explain the code and make it more readable for humans.

Python supports **two** types of comments:

1. Single-line Comments
2. Multi-line Comments

Comments (Single-Line)

Single-line comments start with the **hash character (#)** and extend to the end of the line.

Standalone Single-Line Comment

```
# This is a single-line comment
x = 10
```

Inline Single-Line Comment

```
x = 10 # This is an inline comment
```

Comments (Multi-Line)

Python **doesn't** have a built-in syntax for multi-line comments.

However, you can use a series of single-line comments or a multi-line string (with triple quotes ‘ ‘ ‘ or “ “ “) that is not assigned to a variable.

NOTE: Multi-line string is technically not a comment but a string literal. However, if it's not assigned to any variable, Python will ignore it, making it functionally equivalent to a comment.

Example with single-line comments

```
# This is a multi-line comment
# that spans multiple lines.
x = 10
```

Example with a multi-line string

```
"""
This is a multi-line comment
that spans multiple lines.
"""
x = 10
```

Docstrings

Documentation Comments, aka, **Docstrings** are a specific kind of comment used to describe what a **function**, **class**, or **module** does.

They are written using triple quotes (**‘‘‘** or **“““**) and should be placed as the first statement in the **function, class, or module**.

Python

```python
def add(a, b):
    """
    This function adds two numbers.

    Parameters:
    a (int, float): The first number.
    b (int, float): The second number.

    Returns:
    int, float: The sum of the two numbers.
    """
    return a + b
```

Accessing Docstrings

Docstrings can be accessed using the **.__doc__** attribute or the **help()** function.

This allows you to easily view the documentation for any module, class, function, or method.

1. print(add.__doc__)

2. print(help(add))

Python

```python
def add(a, b):
    """
    This function adds two numbers.

    Parameters:
    a (int, float): The first number.
    b (int, float): The second number.

    Returns:
    int, float: The sum of the two numbers.
    """
    return a + b

print(add.__doc__) # You can use this
print(help(add))   # Or this
```

03

Scope and Rules

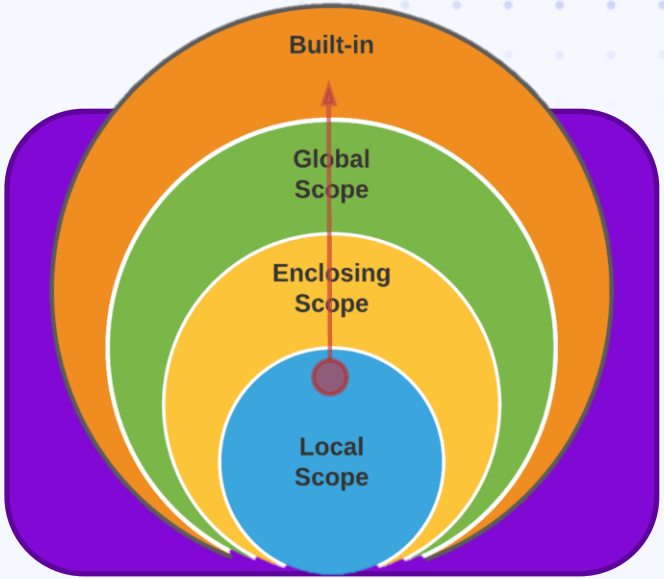
Scope

The region or context within a program where a variable is accessible is called **Scope**.

Variable scope is crucial because it determines where variables can be used throughout your code.

There are **four** types of scopes:

1. Local
2. Enclosed
3. Global
4. Built-in



Credit: Python Scope - Complete Tutorial (hands-on.cloud) - **Andrei Maksimov**

Local Scope

A variable defined **inside** a function is local to that function. It is only accessible within that function.

Python

```python
def my_function():
    x = 10  # x is a local variable
    print(x)  # prints 10

my_function()
print(x)  # This will raise an error because x is not accessible outside the function.
```

Enclosing Scope

This is relevant in **nested** functions. A variable in the enclosing (outer) function is accessible in the nested (inner) function.

Python

```python
def outer_function():
    x = 20  # x is in the enclosing scope

    def inner_function():
        print(x)  # inner_function can access x from outer_function

    inner_function()

outer_function()
```

Global Scope

Variable declared **outside** of the function (at the top-level) have global scope. They can be accessed from anywhere within the code.

Python

```python
x = 30  # x is a global variable

def my_function():
    print(x)  # Accessible here

my_function()
print(x)  # Also accessible here
```

Built-in Scope

These are names **preassigned** in Python. They include functions like **print()**, **len()**, etc., and are always accessible.

Python

```python
s="Python"
print(s) # Output is Python

def func():
    if(True):
        print("Inside the function") # Output is Inside the function

func()
```

Global Keyword

Global keyword can be used in these **two** scenarios:

1. For **creating** global variable within a local scope
2. For **modifying** a global variable within a local scope

Python

```python
def myfunc():

    # create a global variable
    global x
    x = 10

myfunc()

print(x)
```

Python

```python
x = 30

def my_function():
    global x
    x = 40  # modifies the global variable x
    print(x)  # prints 40

my_function()
print(x)  # prints 40
```

Nonlocal Keyword

The **nonlocal** keyword is used to modify a variable from the outer function inside the inner function.

Without Nonlocal	With Nonlocal

`def outer():`
`  x = "outer"`
 	
`  def inner():`
`  x = "inner"`
`  print(x)`
 	
`  inner()`
`  print(x)`
 	
`outer()`
	`def outer():`
	`  x = "outer"`
	
	`  def inner():`
	`# Refer to the variable in the enclosing scope`
	`  nonlocal x`
	`  x = "inner"`
	`  print(x)`
	
	`  inner()`
	`  print(x)`
	`outer()`

LEGB Rule

01 — **Local** → Names assigned within a function, and not declared as global or nonlocal

02 — **Enclosing** → Names in the local scope of any enclosing functions, from inner to outer.

03 — **Global** → Names assigned at the top level of a module or declared as global in a def within the file.

04 — **Built-in** → Names preassigned in the built-in names module (open, range, etc.).

Knowledge Reinforcement

1

Question

What is the output of the following code?

Python

```python
x = 10

def my_function():
    x = 20
    print(x)

my_function()
print(x)
```

Answer

a) 10 20

b) 20 10

c) 20 20

d) Error

1

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    x = 20
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my_function()
print(x)
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Answer

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2

Question

Which of the following is the correct way to write a multi-line **comment** in Python?

Answer

a) # This is a comment

b) '''This is a multi-line comment'''

c) """This is a multi-line comment"""

d) All of them

2

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b) '''This is a multi-line comment'''

c) """This is a multi-line comment"""

d) All of them

3

Question

Which of the following best describes a **docstring** in Python?

Answer

a) A comment used to describe complex code logic

b) A special type of comment used to document functions, classes, and modules

c) A multi-line comment used to prevent a section of code from running

d) A single-line comment written after code to explain it

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Question

What will happen if you mix tabs and spaces for **indentation** in a Python script?

Answer

A) The code will run correctly

B) It may produce an IndentationError

C) The code will be ignored

D) It will automatically convert to spaces

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5

Question

What should you include in a function's **docstring**?

Answer

a) Function's purpose, parameters, return values, and any exceptions

b) A detailed breakdown of each line of code in the function

c) Only the function's return type

d) The code itself, explained line by line

5

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