

Namespaces

A namespace is a space that holds names(identifiers).Programmatically speaking, namespaces are dictionary of identifiers(keys) and their objects(values)

There are 4 types of namespaces:

- Builtin Namespace
- Global Namespace
- Enclosing Namespace
- Local Namespace

✓ Scope and LEGB Rule

A scope is a textual region of a Python program where a namespace is directly accessible.

The interpreter searches for a name from the inside out, looking in the local, enclosing, global, and finally the built-in scope. If the interpreter doesn't find the name in any of these locations, then Python raises a NameError exception.

```
# local and global
# global var
a = 2
```

```
def temp():
    # local var
    b = 3
    print(b)
```

```
temp()
print(a)
```

```
3
2
```

```
# local and global -> same name
a = 2
```

```
def temp():
    # local var
    a = 3
    print(b)
```

```
temp()
print(a)
```

```
# local and global -> local does not have but global has
a = 2
```

```
def temp():
    # local var
    print(a)
```

```
temp()
print(a)
```

```
2
2
```

```
# local and global -> editing global
a = 2
```

```
def temp():
    # local var
    a += 1
    print(a)
```

```
temp()
print(a)
```

```

-----
UnboundLocalError                                Traceback (most recent call last)
<ipython-input-49-0bfff4ae6448f> in <module>
      7     print(a)
      8
----> 9 temp()
     10 print(a)

<ipython-input-49-0bfff4ae6448f> in temp()
      4 def temp():
      5     # local var
----> 6     a += 1
      7     print(a)
      8

UnboundLocalError: local variable 'a' referenced before assignment

```

```
a = 2
```

```
def temp():
    # local var
    global a
    a += 1
    print(a)
```

```
temp()
print(a)
```

```
3
3
```

```
# local and global -> global created inside local
```

```
def temp():
    # local var
    global a
    a = 1
    print(a)
```

```
temp()
print(a)
```

```
# local and global -> function parameter is local
```

```
def temp(z):
    # local var
    print(z)
```

```
a = 5
temp(5)
print(a)
print(z)
```

```
5
5
```

```

-----
NameError                                Traceback (most recent call last)
<ipython-input-51-aac3f4d9657f> in <module>
      7 temp(5)
      8 print(a)
----> 9 print(z)

NameError: name 'z' is not defined

```

```
# built-in scope
import builtins
print(dir(builtins))
```

```
['ArithmeticError', 'AssertionError', 'AttributeError', 'BaseException', 'BlockingIOError', 'BrokenPipeError', 'BufferError', 'BytesWarn
```

```
# how to see all the built-ins
```

```
# renaming built-ins
L = [1,2,3]
print(max(L))
def max():
    print('hello')

print(max(L))
```

```
-----
TypeError                                 Traceback (most recent call last)
<ipython-input-68-c19f3451a38f> in <module>
      1 # renaming built-ins
      2 L = [1,2,3]
----> 3 print(max(L))
      4 def max():
      5     print('hello')

TypeError: max() takes 0 positional arguments but 1 was given
```

```
# Enclosing scope
def outer():
    def inner():
        print(a)
    inner()
    print('outer function')
```

```
outer()
print('main program')
```

```
1
outer function
main program
```

```
# nonlocal keyword
def outer():
    a = 1
    def inner():
        nonlocal a
        a += 1
        print('inner',a)
    inner()
    print('outer',a)
```

```
outer()
print('main program')
```

```
inner 2
outer 2
main program
```

```
# Summary
```

▼ Decorators

A decorator in python is a function that receives another function as input and adds some functionality(decoration) to and it and returns it.

This can happen only because python functions are 1st class citizens.

There are 2 types of decorators available in python

- Built in decorators like `@staticmethod`, `@classmethod`, `@abstractmethod` and `@property` etc
- User defined decorators that we programmers can create according to our needs

```
# Python are 1st class function
```

```
def modify(func,num):
    return func(num)
```

```
def square(num):
    return num**2
```

```
modify(square,2)
```

```
4
```

```
# simple example
```

```
def my_decorator(func):
    def wrapper():
        print('*****')
        func()
        print('*****')
    return wrapper
```

```
def hello():
    print('hello')
```

```
def display():
    print('hello nitish')
```

```
a = my_decorator(hello)
a()
```

```
b = my_decorator(display)
b()
```

```
*****
hello
*****
*****
hello nitish
*****
```

```
# more functions
```

```
# how this works -> closure?
```

```
# python tutor
```

```
# Better syntax?
# simple example
```

```
def my_decorator(func):
    def wrapper():
        print('*****')
        func()
        print('*****')
    return wrapper
```

```
@my_decorator
def hello():
    print('hello')
```

```
hello()
```

```
*****
hello
*****
```

```
# anything meaningful?
import time

def timer(func):
    def wrapper(*args):
        start = time.time()
        func(*args)
        print('time taken by',func.__name__,time.time()-start,'secs')
    return wrapper

@timer
def hello():
    print('hello wolrd')
    time.sleep(2)

@timer
def square(num):
    time.sleep(1)
    print(num**2)

@timer
def power(a,b):
    print(a**b)

hello()
square(2)
power(2,3)
```

```
hello wolrd
time taken by hello 2.003671884536743 secs
4
time taken by square 1.0009939670562744 secs
8
time taken by power 2.1696090698242188e-05 secs
```

```
# A big problem
```

```
# One last example -> decorators with arguments
```

```
@checkdt(int)
def square(num):
    print(num**2)

def sanity_check(data_type):
    def outer_wrapper(func):
        def inner_wrapper(*args):
            if type(*args) == data_type:
                func(*args)
            else:
                raise TypeError('Ye datatype nai chalega')
        return inner_wrapper
    return outer_wrapper

@sanity_check(int)
def square(num):
    print(num**2)

@sanity_check(str)
def greet(name):
    print('hello',name)

square(2)

4
```

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