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-49-0bff4ae6448f> in <module>
      7   print(a)
      8
----> 9 temp()
     10 print(a)

<ipython-input-49-0bff4ae6448f> in temp()
      4 def temp():
      5   # local var
----> 6   a += 1
      7   print(a)
      8

UnboundLocalError: local variable 'a' referenced before assignment
```

SEARCH STACK OVERFLOW

```
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
```

SEARCH STACK OVERFLOW

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

```
['ArithmeticError', 'AssertionError', 'AttributeError', 'BaseException', 'BlockingIOError', 'BrokenPipeError', 'BufferEr
```

```
# 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

SEARCH STACK OVERFLOW
```

```
# 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

# A big problem
def hello():
```

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


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

```
@timer
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
```