Scope and userdefined functions

PYTHON DATA SCIENCE TOOLBOX (PART 1)



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Crash course on scope in functions

- Not all objects are accessible everywhere in a script
- Scope part of the program where an object or name may be accessible
 - Global scope defined in the main body of a script
 - Local scope defined inside a function
 - Built-in scope names in the pre-defined built-ins module

Global vs. local scope (1)

```
def square(value):
    """Returns the square of a number."""
    new_val = value ** 2
    return new val
square(3)
new_val
                                Traceback (most recent call last)
NameError
<ipython-input-3-3cc6c6de5c5c> in <module>()
<hr />-> 1 new_value
NameError: name 'new_val' is not defined
```



Global vs. local scope (2)

```
new_val = 10

def square(value):
    """Returns the square of a number."""
    new_val = value ** 2
    return new_val
square(3)
```

new_val

10



Global vs. local scope (3)

```
new_val = 10

def square(value):
    """Returns the square of a number."""
    new_value2 = new_val ** 2
    return new_value2
square(3)
```

```
100
```

```
new_val = 20
square(3)
```

400



Global vs. local scope (4)

```
new_val = 10

def square(value):
    """Returns the square of a number."""
    global new_val
    new_val = new_val ** 2
    return new_val
square(3)
```

100

new_val

100



Let's practice!

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Nested functions

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Nested functions (1)

```
def outer( ... ):
    """    ...
    def inner( ... ):
        """    ...    """
        y = x ** 2
    return ...
```

Nested functions (2)

```
def mod2plus5(x1, x2, x3):
    """Returns the remainder plus 5 of three values."""

    new_x1 = x1 % 2 + 5
    new_x2 = x2 % 2 + 5
    new_x3 = x3 % 2 + 5

    return (new_x1, new_x2, new_x3)
```

Nested functions (3)

```
def mod2plus5(x1, x2, x3):
    """Returns the remainder plus 5 of three values."""
    def inner(x):
        """Returns the remainder plus 5 of a value."""
        return x % 2 + 5
    return (inner(x1), inner(x2), inner(x3))
print(mod2plus5(1, 2, 3))
(6, 5, 6)
```



Returning functions

```
def raise_val(n):
    """Return the inner function."""
    def inner(x):
    """Raise x to the power of n."""
        raised = x ** n
        return raised
    return inner
square = raise_val(2)
cube = raise_val(3)
```

4 64



print(square(2), cube(4))

Using nonlocal

```
def outer():
    """Prints the value of n."""
    n = 1
    def inner():
        nonlocal n
        n = 2
        print(n)
    inner()
    print(n)
outer()
```



Scopes searched

- Local scope
- Enclosing functions
- Global
- Built-in

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Default and flexible arguments

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You'll learn:

- Writing functions with default arguments
- Using flexible arguments
 - Pass any number of arguments to a functions

Add a default argument

```
def power(number, pow=1):
   """Raise number to the power of pow."""
   new_value = number ** pow
   return new_value
power(9, 2)
81
power(9, 1)
power(9)
```



Flexible arguments: *args (1)

```
def add_all(*args):
    """Sum all values in *args together."""
    # Initialize sum
    sum_all = 0
    # Accumulate the sum
    for num in args:
        sum_all += num
    return sum_all
```

Flexible arguments: *args (2)

```
add_all(1)
add_all(1, 2)
3
add_all(5, 10, 15, 20)
50
```

Flexible arguments: **kwargs

```
print_all(name="Hugo Bowne-Anderson", employer="DataCamp")
```

name: Hugo Bowne-Anderson

employer: DataCamp



Flexible arguments: **kwargs

```
def print_all(**kwargs):
    """Print out key-value pairs in **kwargs."""

# Print out the key-value pairs
    for key, value in kwargs.items():
        print(key + \": \" + value)
```

```
print_all(name="dumbledore", job="headmaster")
```

```
job: headmaster
name: dumbledore
```



Let's practice!

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Bringing it all together

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Next exercises:

- Generalized functions:
 - Count occurrences for any column
 - Count occurrences for an arbitrary number of columns

Add a default argument

```
def power(number, pow=1):
    """Raise number to the power of pow."""
    new_value = number ** pow
    return new_value
power(9, 2)
81
power(9)
```



Flexible arguments: *args (1)

```
def add_all(*args):
    """Sum all values in *args together."""
    # Initialize sum
    sum_all = 0
    # Accumulate the sum
    for num in args:
        sum_all = sum_all + num
    return sum_all
```

Let's practice!

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