PYTHON DATA SCIENCE TOOLBOX I

Scope and user-defined functions

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)

```
In [1]: def square(value):
   ...:     """Returns the square of a number."""
   ...:     new_val = value ** 2
   ...:     return new_val

In [2]: square(3)
Out[2]: 9

In [3]: new_val
---------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-3-3cc6c6de5c5c> in <module>()
----> 1 new_value
NameError: name 'new_val' is not defined
```

Global vs. local scope (2)

```
In [1]: new_val = 10

In [2]: def square(value):
   ...:     """Returns the square of a number."""
   ...:     new_val = value ** 2
   ...:     return new_val

In [3]: square(3)
Out[3]: 9

In [4]: new_val
Out[4]: 10
```

Global vs. local scope (3)

```
In [1]: new_val = 10

In [2]: def square(value):
   ...:     """Returns the square of a number."""
   ...:     new_value2 = new_val ** 2
   ...:     return new_value2

In [3]: square(3)
Out[3]: 100

In [4]: new_val = 20

In [5]: square(3)
Out[5]: 400
```

Global vs. local scope (4)

```
In [1]: new_val = 10

In [2]: def square(value):
   ...:     """Returns the square of a number."""
   ...:     global new_val
   ...:     new_val = new_val ** 2
   ...:     return new_val

In [3]: square(3)
Out[3]: 100

In [4]: new_val
Out[4]: 100
```

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Let’s practice!

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Default and flexible arguments

You'll learn:

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

Add a default argument

```
In [1]: def power(number, pow=1):
  ....:     """Raise number to the power of pow."""
  ....:     new_value = number ** pow
  ....:     return new_value

In [2]: power(9, 2)
Out[2]: 81

In [3]: power(9, 1)
Out[3]: 9

In [4]: power(9)
Out[4]: 9
```

Flexible arguments: *args (1)

add_all.py

```
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)

```
In [1]: add_all(1)
Out[1]: 1

In [2]: add_all(1, 2)
Out[2]: 3

In [3]: add_all(5, 10, 15, 20)
Out[3]: 50
```

Flexible arguments: **kwargs

```
In [1]: print_all(name="Hugo Bowne-Anderson", employer="DataCamp")
name: Hugo Bowne-Anderson
employer: DataCamp
```

Flexible arguments: **kwargs

kwargs.py

```
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)
```

```
In [1]: print_all(name="dumbledore", job="headmaster")
job: headmaster
name: dumbledore
```

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Let’s practice!

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Bringing it all together

Next exercises:

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

Add a default argument

power.py

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

```
In [1]: power(9, 2)
Out[1]: 81

In [2]: power(9)
Out[2]: 9
```

Flexible arguments: *args (1)

add_all.py

```
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
```

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Let’s practice!