INTRO TO PYTHON FOR DATA SCIENCE

Functions

Functions

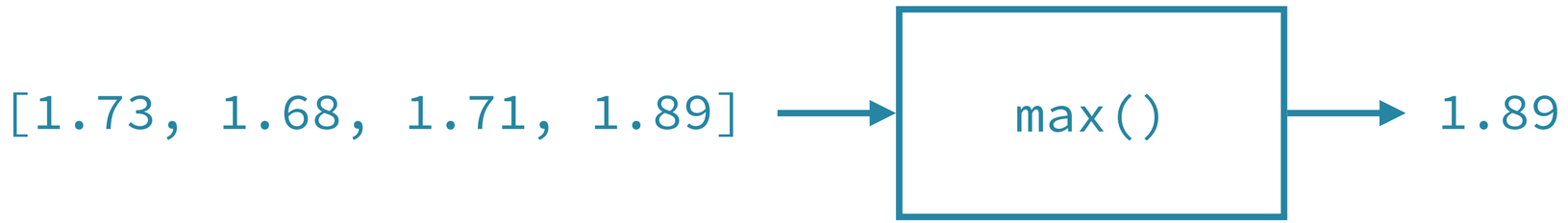
- Nothing new!
- `type()`
- Piece of reusable code
- Solves particular task
- Call function instead of writing code yourself

Example

```
In [1]: fam = [1.73, 1.68, 1.71, 1.89]

In [2]: fam
Out[2]: [1.73, 1.68, 1.71, 1.89]

In [3]: max(fam)
Out[3]: 1.89
```



Example

```
In [1]: fam = [1.73, 1.68, 1.71, 1.89]

In [2]: fam
Out[2]: [1.73, 1.68, 1.71, 1.89]

In [3]: max(fam)
Out[3]: 1.89

In [4]: tallest = max(fam)

In [5]: tallest
Out[5]: 1.89
```

round()

```
In [6]: round(1.68, 1)
Out[6]: 1.7

In [7]: round(1.68)
Out[7]: 2

In [8]: help(round)
```

Open up documentation

```
  Help on built-in function round in module builtins:

  round(...)
      round(number[, ndigits]) -> number

      Round a number to a given precision in decimal digits
      (default 0 digits). This returns an int when called with
      one argument, otherwise the same type as the number.
      ndigits may be negative.
```

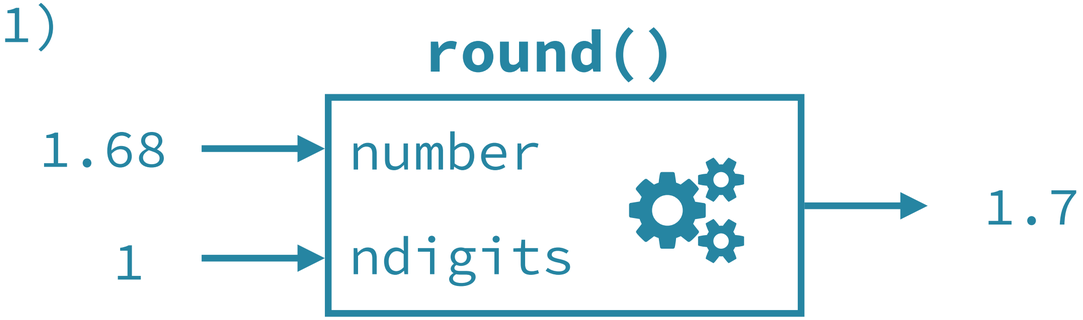
round()

```
In [8]: help(round)

  round(...)
      round(number[, ndigits]) -> number

      Round a number to a given precision in decimal digits
      (default 0 digits). This returns an int when called with
      one argument, otherwise the same type as the number.
      ndigits may be negative.
```

round(1.68, 1)



round()

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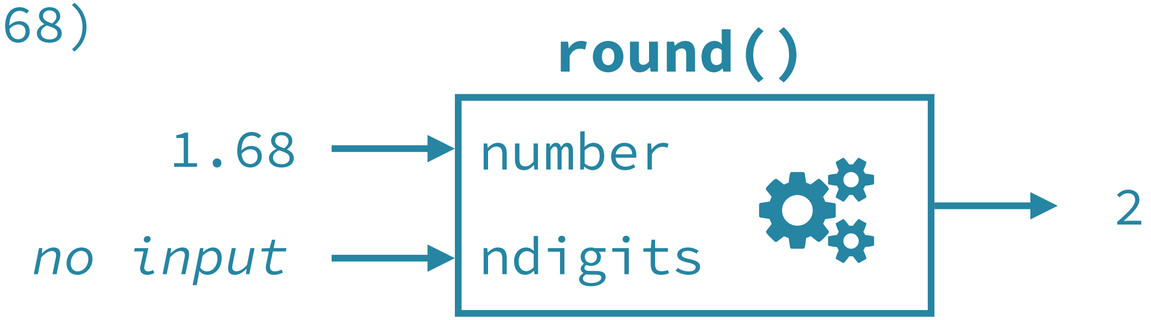
In [8]: help(round)

  round(...)
      round(number[, ndigits]) -> number

      Round a number to a given precision in decimal digits
      (default 0 digits). This returns an int when called with
      one argument, otherwise the same type as the number.
      ndigits may be negative.
```

round(1.68)



round()

```
In [8]: help(round)

  round(...)
      round(number[, ndigits]) -> number

      Round a number to a given precision in decimal digits
      (default 0 digits). This returns an int when called with
      one argument, otherwise the same type as the number.
      ndigits may be negative.
```

```
round(number)

round(number, ndigits)
```

Find functions

- How to know?
- Standard task -> probably function exists!
- The internet is your friend

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Let’s practice!

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Methods

Built-in Functions

- Maximum of list: `max()`
- Length of list or string: `len()`
- Get index in list: ?
- Reversing a list: ?

Back 2 Basics

		type	examples of methods
`In [1]: sister = "liz"`	Object	`str`	`capitalize()` `replace()`
`In [2]: height = 1.73`	Object	`float`	`bit_length()` `conjugate()`
`In [3]: fam = ["liz", 1.73, "emma", 1.68, "mom", 1.71, "dad", 1.89]`	Object	`list`	`index()` `count()`

Methods: Functions that belong to objects

list methods

```
In [4]: fam
Out[4]: ['liz', 1.73, 'emma', 1.68, 'mom', 1.71, 'dad', 1.89]

In [5]: fam.index("mom")
Out[5]: 4

In [6]: fam.count(1.73)
Out[6]: 1
```

"Call method index() on fam"

str methods

```
In [7]: sister
Out[7]: 'liz'

In [8]: sister.capitalize()
Out[8]: 'Liz'

In [9]: sister.replace("z", "sa")
Out[9]: 'lisa'
```

Methods

- Everything = object
- Object have methods associated, depending on type

```
In [10]: sister.replace("z", "sa")
Out[10]: 'lisa'

In [11]: fam.replace("mom", "mommy")
AttributeError: 'list' object has no attribute 'replace'

In [12]: sister.index("z")
Out[12]: 2

In [13]: fam.index("mom")
Out[13]: 4
```

Methods (2)

```
In [14]: fam
Out[14]: ['liz', 1.73, 'emma', 1.68, 'mom', 1.71, 'dad', 1.89]

In [15]: fam.append("me")

In [16]: fam
Out[16]: ['liz', 1.73, 'emma', 1.68, 'mom', 1.71, 'dad', 1.89, 'me']

In [17]: fam.append(1.79)

In [18]: fam
Out[18]: ['liz', 1.73, 'emma', 1.68, 'mom', 1.71, 'dad', 1.89, 'me', 1.79]
```

Summary

- Functions

```
In [11]: type(fam)
Out[11]: list
```

- Methods: call functions *on* objects

```
In [12]: fam.index("dad")
Out[12]: 6
```

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Let’s practice!

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Packages

Motivation

- Functions and methods are powerful
- All code in Python distribution?
  - Huge code base: messy
  - Lots of code you won't use
  - Maintenance problem

Packages

- Directory of Python Scripts
- Each script = module
- Specify functions, methods, types
- Thousands of packages available
  - Numpy
  - Matplotlib
  - Scikit-learn

```
pkg/
   mod1.py
   mod2.py
   ...
```

Install package

- http://pip.readthedocs.org/en/stable/installing/
- Download `get-pip.py`
- Terminal:
  - `python3 get-pip.py`
  - `pip3 install numpy`

Import package

```
In [1]: import numpy

In [2]: array([1, 2, 3])
NameError: name 'array' is not defined

In [3]: numpy.array([1, 2, 3])
Out[3]: array([1, 2, 3])

In [4]: import numpy as np

In [5]: np.array([1, 2, 3])
Out[5]: array([1, 2, 3])

In [6]: from numpy import array

In [7]: array([1, 2, 3])
Out[7]: array([1, 2, 3])
```

from numpy import array

my_script.py

```
from numpy import array

fam = ["liz", 1.73, "emma", 1.68,
       "mom", 1.71, "dad", 1.89]

...

fam_ext = fam + ["me", 1.79]

...

print(str(len(fam_ext)) + " elements in fam_ext")

...

np_fam = array(fam_ext)
```

Using Numpy, but not very clear

import numpy

my_script.py

```
import numpy

fam = ["liz", 1.73, "emma", 1.68,
       "mom", 1.71, "dad", 1.89]

...

fam_ext = fam + ["me", 1.79]

...

print(str(len(fam_ext)) + " elements in fam_ext")

...

np_fam = numpy.array(fam_ext)
```

Clearly using Numpy

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Let’s practice!