Functions

INTRODUCTION TO PYTHON

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Functions

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

Example

```
fam = [1.73, 1.68, 1.71, 1.89]
fam
```

```
[1.73, 1.68, 1.71, 1.89]
```

```
max(fam)
```

```
1.89
```

Example

```
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[1.73, 1.68, 1.71, 1.89]
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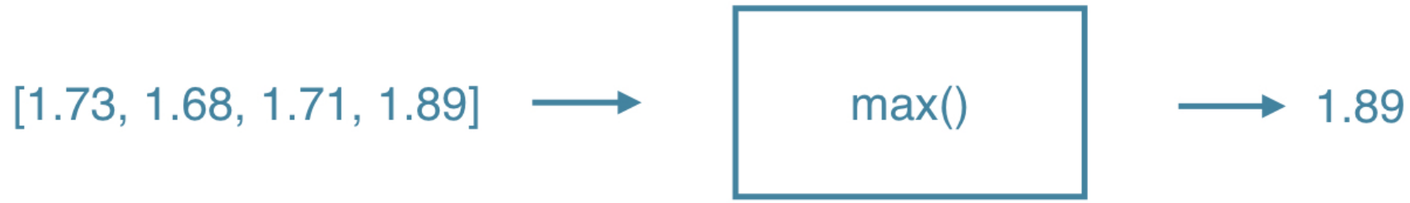

Example

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fam
```

```
[1.73, 1.68, 1.71, 1.89]
```

```
max(fam)
```

```
1.89
```

```
tallest = max(fam)
tallest
```

```
1.89
```

round()

```
round(1.68, 1)
```

```
1.7
```

```
round(1.68)
```

```
2
```

```
help(round) # Open up documentation
```

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

round(number, ndigits=None)
    Round a number to a given precision in decimal digits.

    The return value is an integer if ndigits is omitted or None.
    Otherwise the return value has the same type as the number. ndigits may be negative.
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round(1.68, 1)

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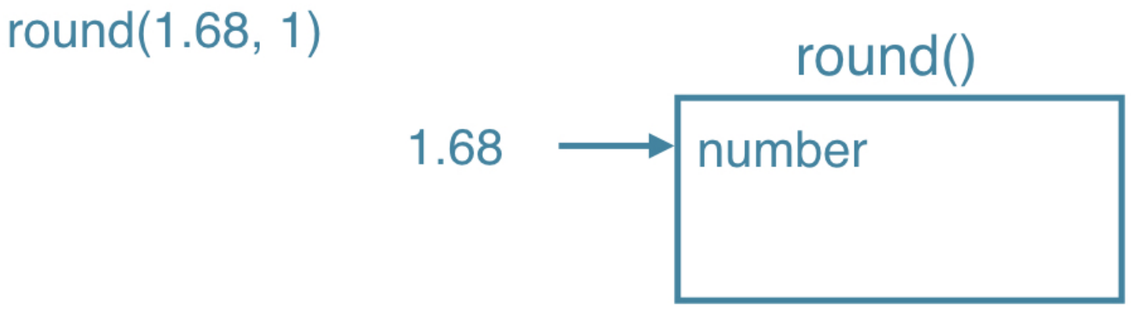

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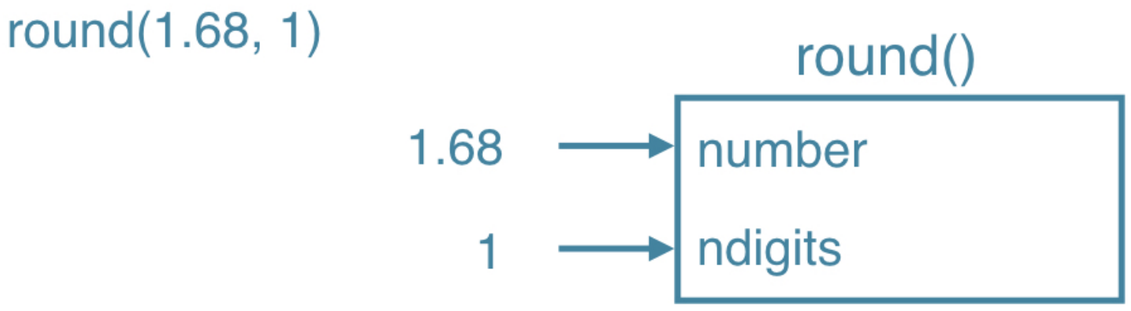

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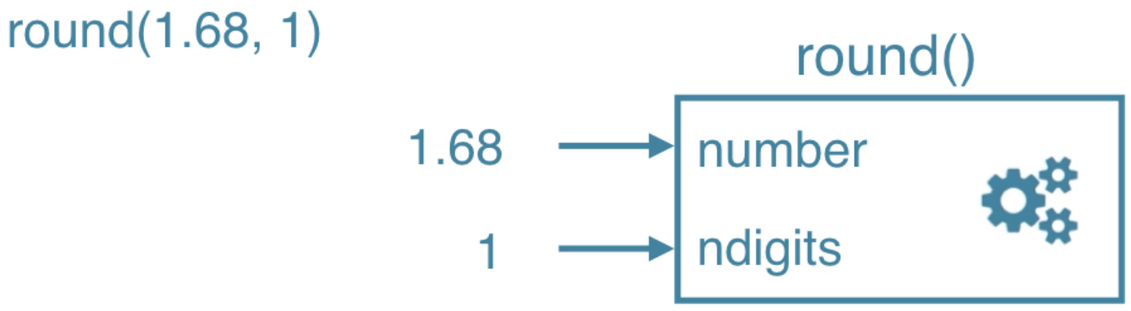

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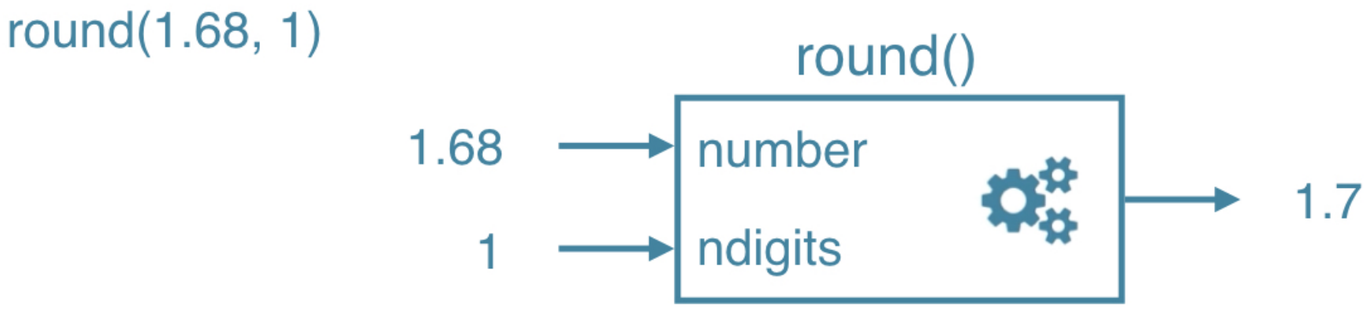

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```

round(1.68)

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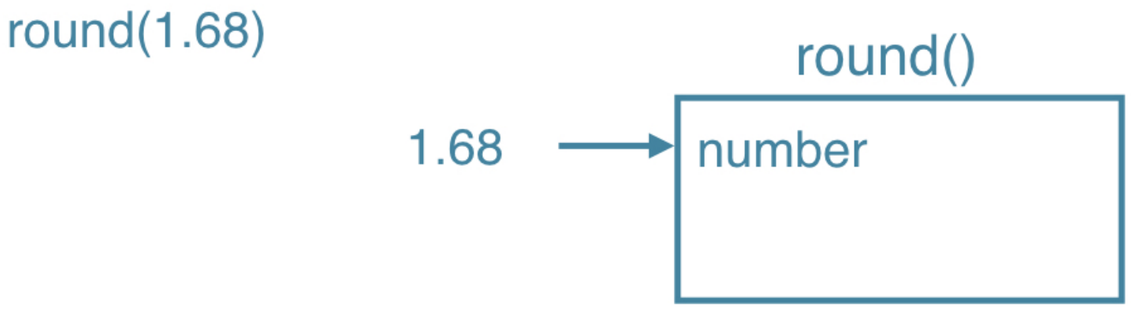

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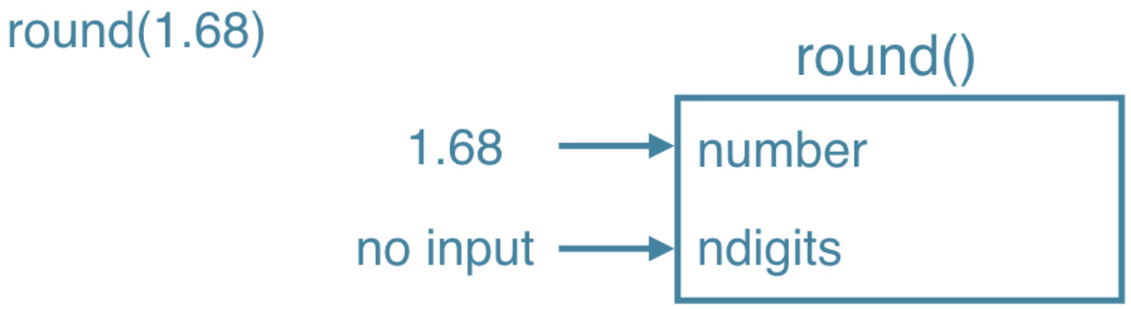

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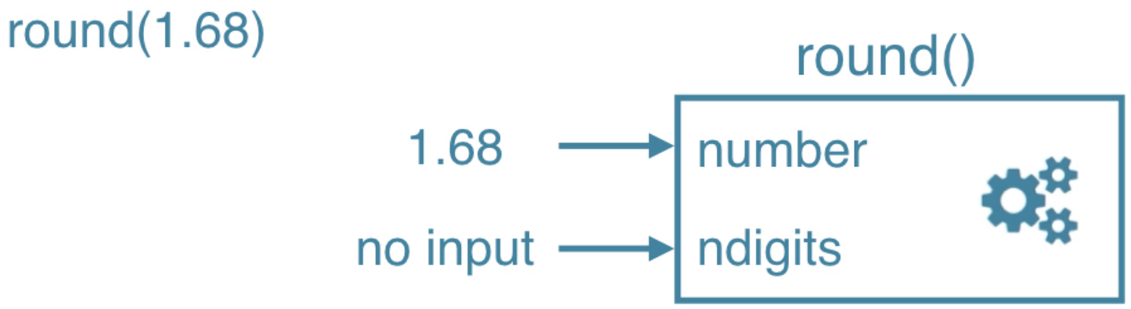

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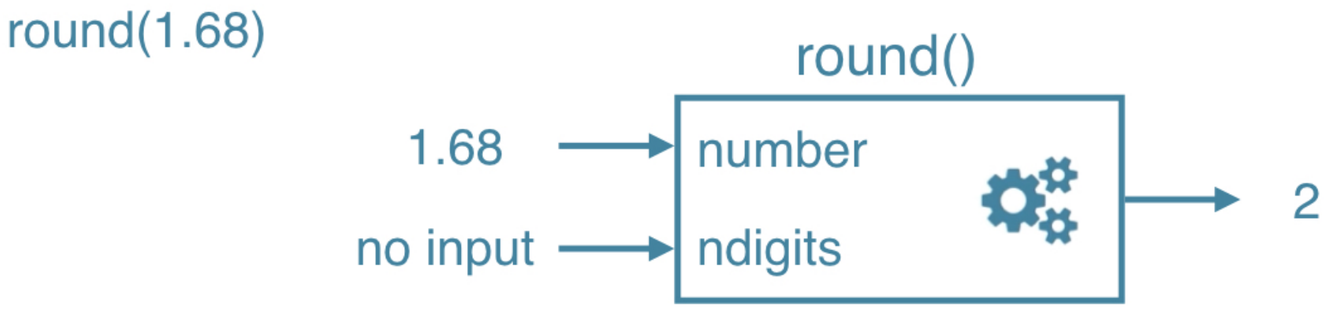

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help(round)
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```

- `round(number)`
- `round(number, ndigits)`

Find functions

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

Let's practice!

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Methods

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Built-in Functions

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

Back 2 Basics

```
sister = "liz"
```

Object

```
height = 1.73
```

Object

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

Object

Back 2 Basics

```
sister = "liz"
```

```
height = 1.73
```

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

	type
Object	str
Object	float
Object	list

- Methods: Functions that belong to objects

Back 2 Basics

```
sister = "liz"
```

```
height = 1.73
```

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

	type	examples of methods
Object	str	capitalize() replace()
Object	float	bit_length() conjugate()
Object	list	index() count()

- Methods: Functions that belong to objects

list methods

```
fam
```

```
['liz', 1.73, 'emma', 1.68, 'mom', 1.71, 'dad', 1.89]
```

```
fam.index("mom") # "Call method index() on fam"
```

```
4
```

```
fam.count(1.73)
```

```
1
```

str methods

```
sister
```

```
'liz'
```

```
sister.capitalize()
```

```
'Liz'
```

```
sister.replace("z", "sa")
```

```
'lisa'
```

Methods

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

```
sister.replace("z", "sa")
```

```
'lisa'
```

```
fam.replace("mom", "mommy")
```

```
AttributeError: 'list' object has no attribute 'replace'
```

Methods

```
sister.index("z")
```

```
2
```

```
fam.index("mom")
```

```
4
```

Methods (2)

```
fam
```

```
['liz', 1.73, 'emma', 1.68, 'mom', 1.71, 'dad', 1.89]
```

```
fam.append("me")
fam
```

```
['liz', 1.73, 'emma', 1.68, 'mom', 1.71, 'dad', 1.89, 'me']
```

```
fam.append(1.79)
fam
```

```
['liz', 1.73, 'emma', 1.68, 'mom', 1.71, 'dad', 1.89, 'me', 1.79]
```

Summary

Functions

```
type(fam)
```

```
list
```

Methods: call functions on objects

```
fam.index("dad")
```

```
6
```

Let's practice!

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Packages

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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

- https://pip.pypa.io/en/stable/installation/
- Download `get-pip.py`
- Terminal:
  - `python3 get-pip.py`
  - `pip3 install numpy`

Import package

```
import numpy
array([1, 2, 3])
```

```
NameError: name 'array' is not defined
```

```
numpy.array([1, 2, 3])
```

```
array([1, 2, 3])
```

```
import numpy as np
np.array([1, 2, 3])
```

```
array([1, 2, 3])
```

```
from numpy import array
array([1, 2, 3])
```

```
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

```
import numpy as np

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 = np.array(fam_ext) # Clearly using NumPy
```

Let's practice!

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