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
```

max()

Example

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

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

```
max(fam)
```

```
1.89
```

[1.73, 1.68, 1.71, 1.89] ⟶ max()

Example

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

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

```
max(fam)
```

```
1.89
```

[1.73, 1.68, 1.71, 1.89] ⟶ max() ⟶ 1.89

Example

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

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

```python
max(fam)
```

```
1.89
```

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

```
1.89
```

round()

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

```
1.7
```

```python
round(1.68)
```

```
2
```

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

```
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.
```
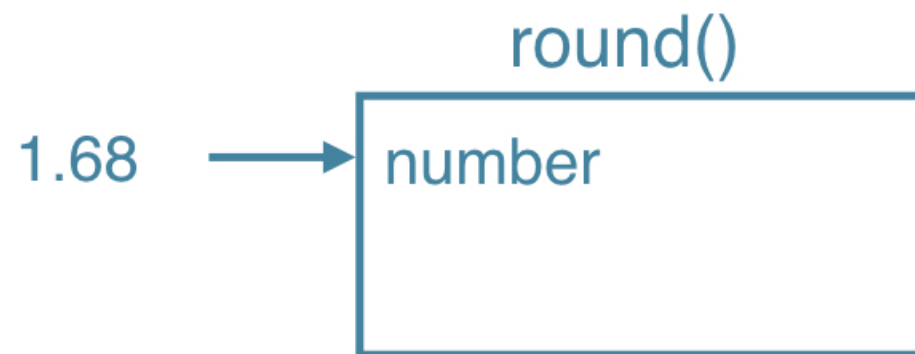
round()

```
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,
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round()

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

    Round a number to a given precision in decimal digits (default 0 digits).
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    otherwise the same type as the number.
    ndigits may be negative.
```

round(1.68, 1)

round()

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)
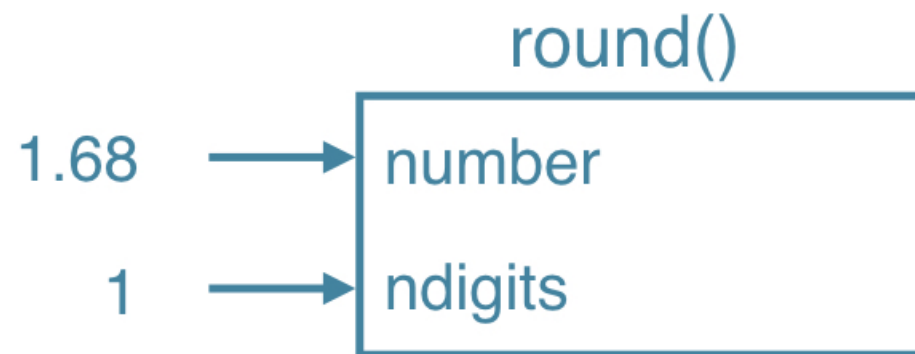
round()

1.68 ⟶ | number |

round()

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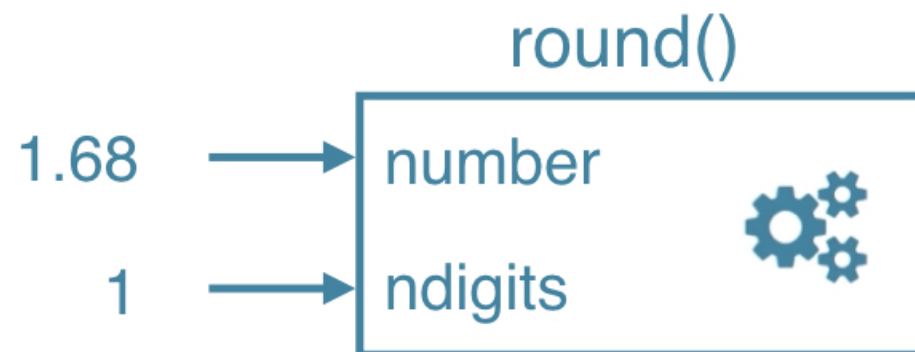
round(1.68, 1)

round()

```
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)
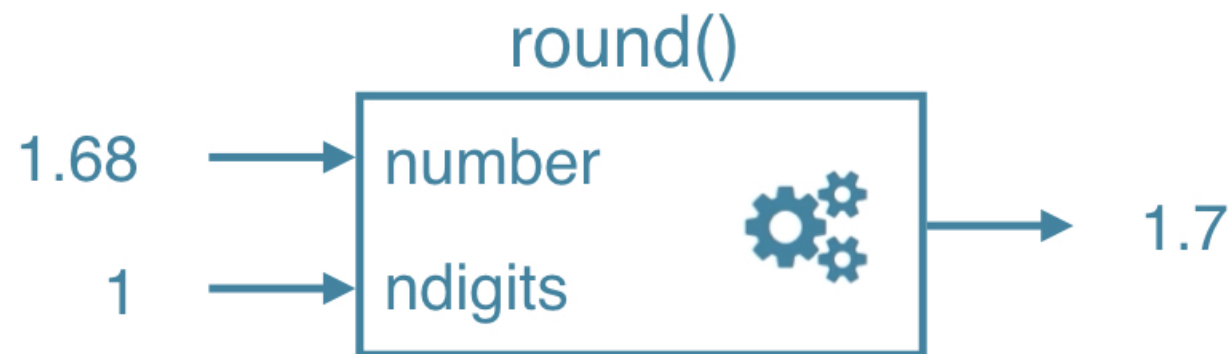
round()

1.68 ⟶ number

1 ⟶ ndigits

round()

```
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()

```
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()

round()

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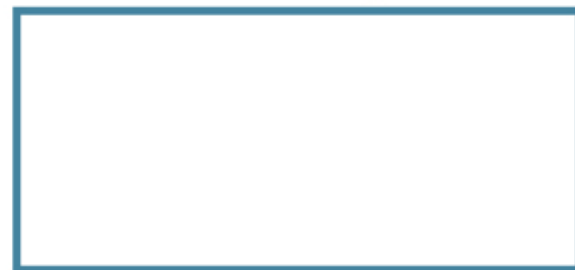
```
round(...)
    round(number[, ndigits]) -> number

    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()

round()

```
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.
```
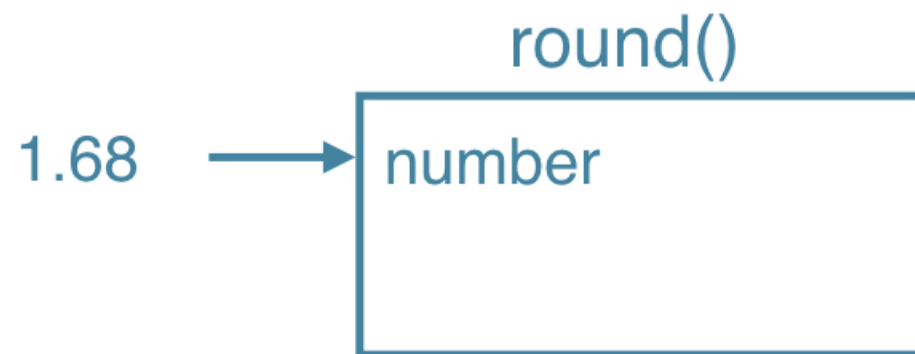
round(1.68)

round()

1.68 ⟶ | number |

round()

```
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.
```
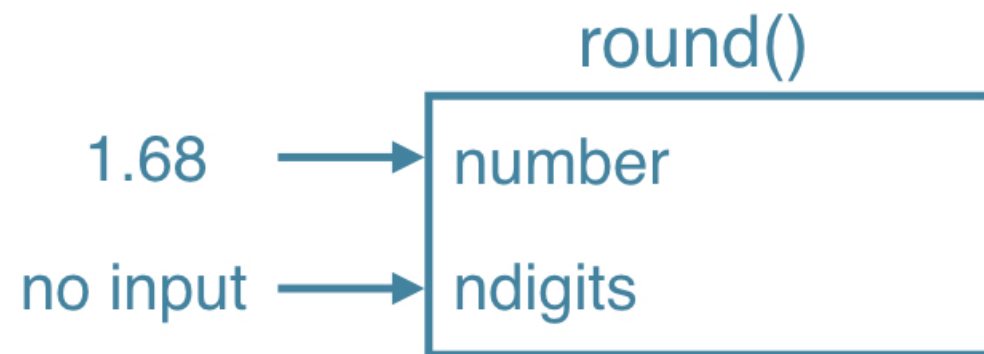
round(1.68)

round()

1.68 ⟶ number

no input ⟶ ndigits

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.
```
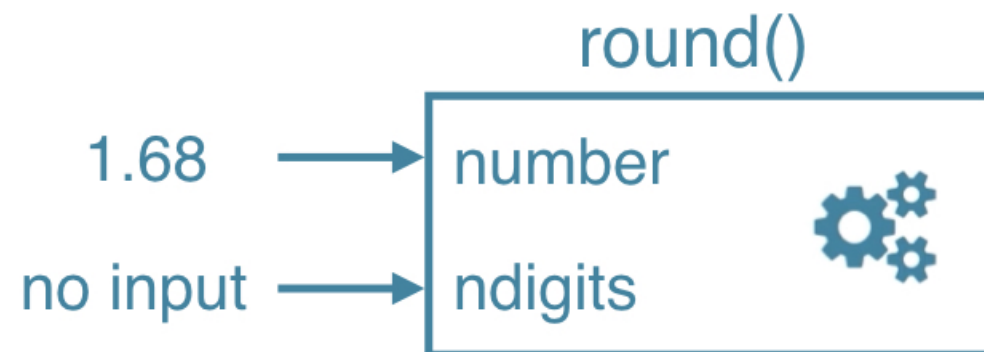
round(1.68)

round()

1.68 → number

no input → ndigits

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.
```
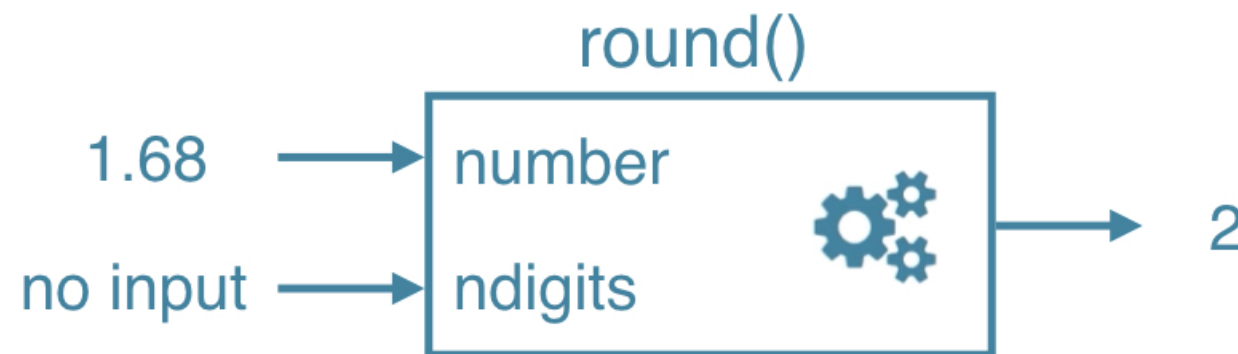
round(1.68)

round()

1.68 ⟶ number

no input ⟶ ndigits

⟶ 2

round()

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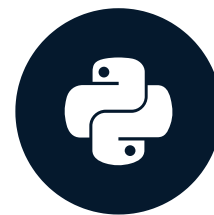
- `round(number, ndigits)`

Find functions

- How to know?

- Standard task -> probably function exists!

- The internet is your friend

Let's practice!

INTRODUCTION TO PYTHON

Methods

INTRODUCTION TO PYTHON

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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

	type

```
sister = "liz"
```

Object   str

```
height = 1.73
```

Object   float

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

Object   list

- Methods: Functions that belong to objects

Back 2 Basics

```python
sister = "liz"
```

```python
height = 1.73
```

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

- Methods: Functions that belong to objects

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

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

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

```
2
```

```python
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
```

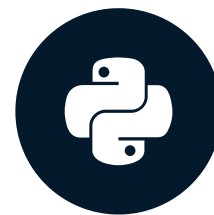## Methods: call functions on objects

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

```
6
```

Let's practice!

INTRODUCTION TO PYTHON

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

```
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

-

```python
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

```python
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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