# 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

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

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

```python
max(fam)
```

```
1.89
```

## Example

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

```
[1.73, 1.68, 1.71, 1.89]
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```
max(fam)
```

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1.89
```

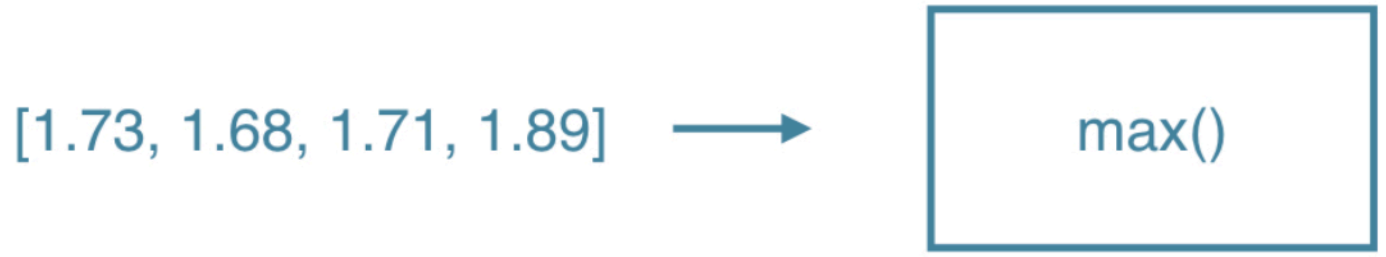

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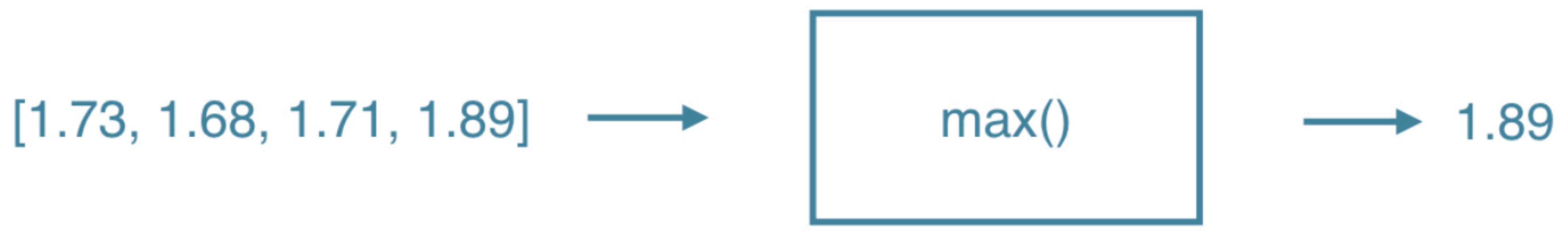

## Example

```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()

```
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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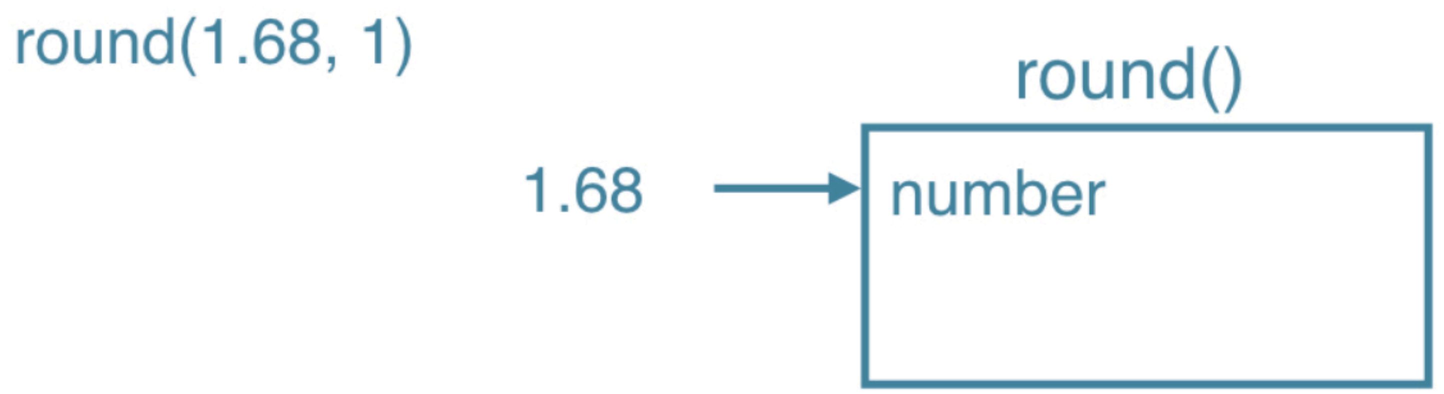

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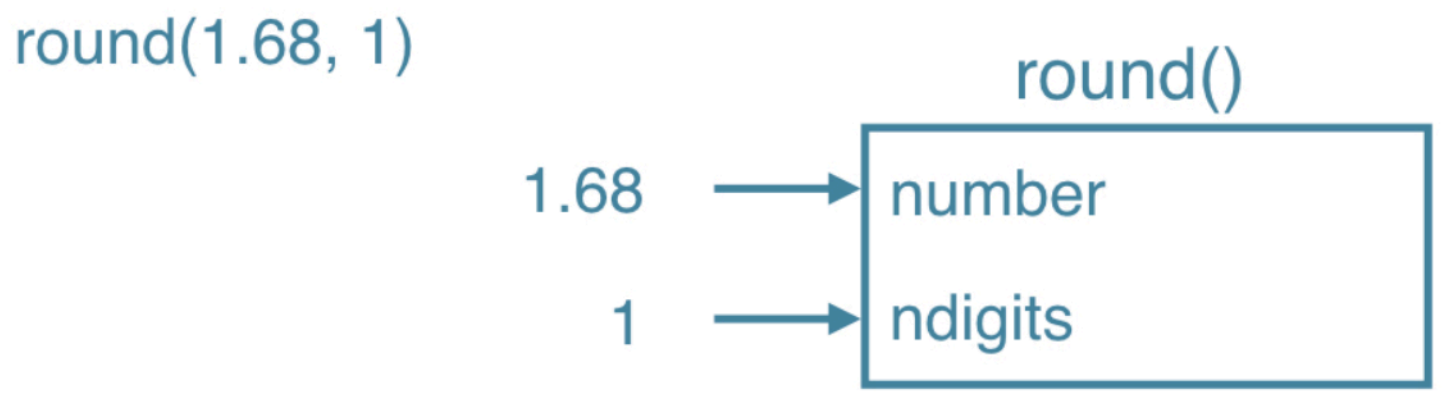

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```
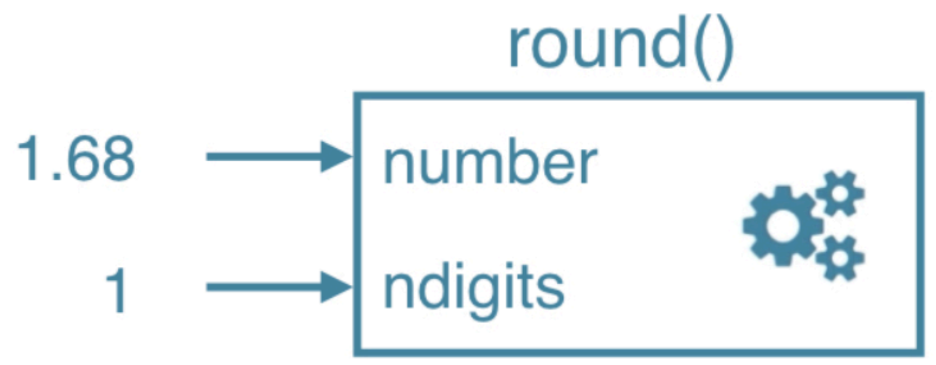

round(1.68, 1)



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help(round)
```

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```
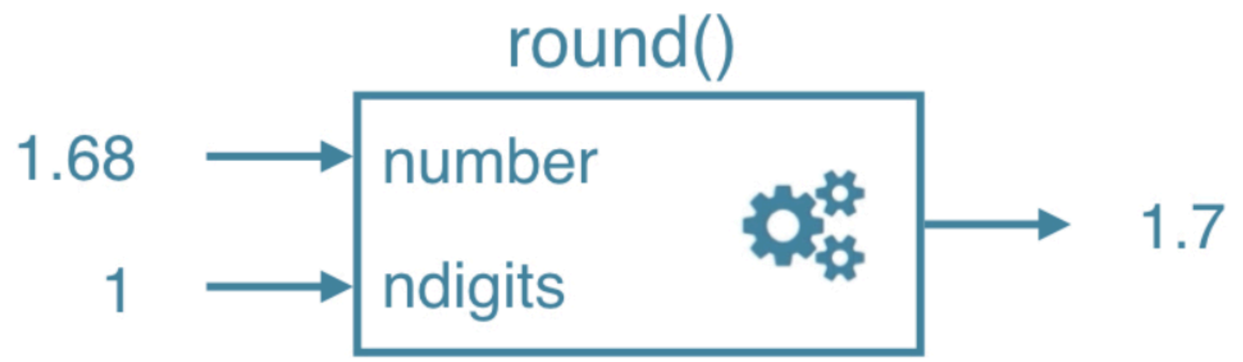

round(1.68, 1)



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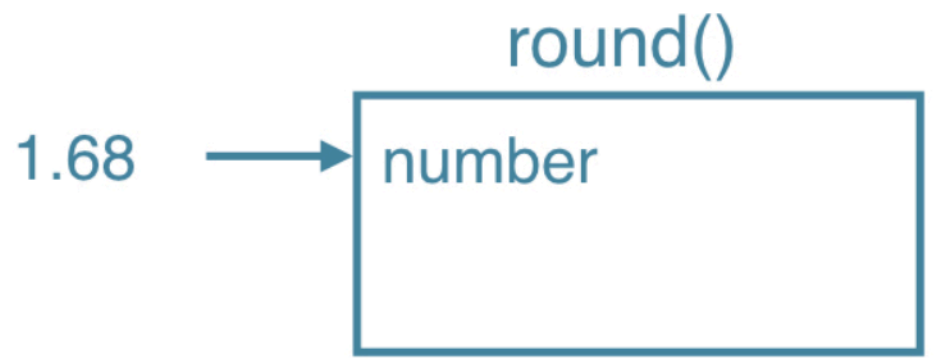
```

round(1.68)



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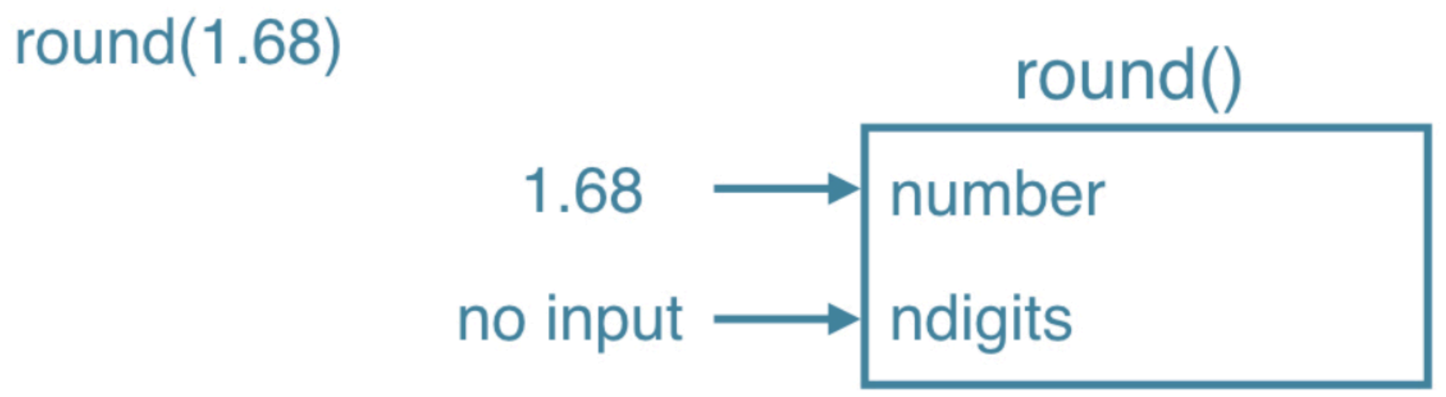

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```
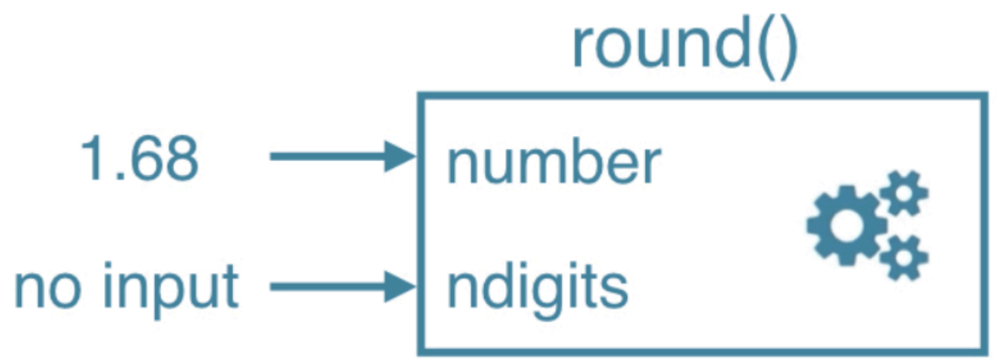

round(1.68)



## round()

```python
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```

```
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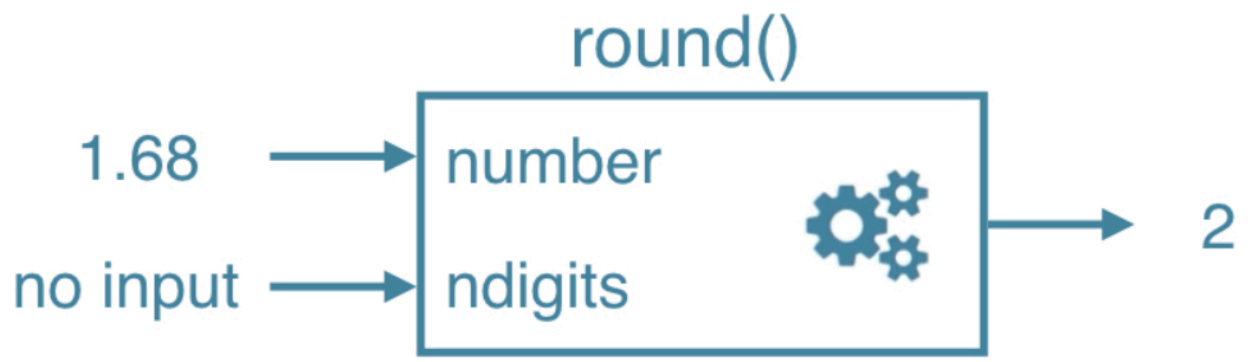
```

round(1.68)



# 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

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

Object

```python
height = 1.73
```

Object

```python
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]
```

- Methods: Functions that belong to objects

| | type | examples of methods |
|---|---|---|
| Object | str | capitalize()<br>replace() |
| Object | float | bit_length()<br>conjugate() |
| Object | list | index()<br>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!

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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

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

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

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

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

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

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

```python
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

```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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