

Functions

INTRODUCTION TO PYTHON



Hugo Bowne-Anderson
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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

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

```
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()

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

round()



round()

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round(...)
```

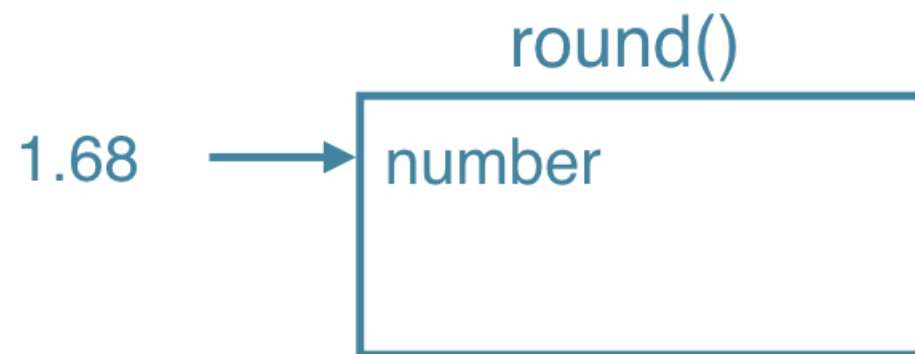
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round(1.68, 1)
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round()

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round(...)
```

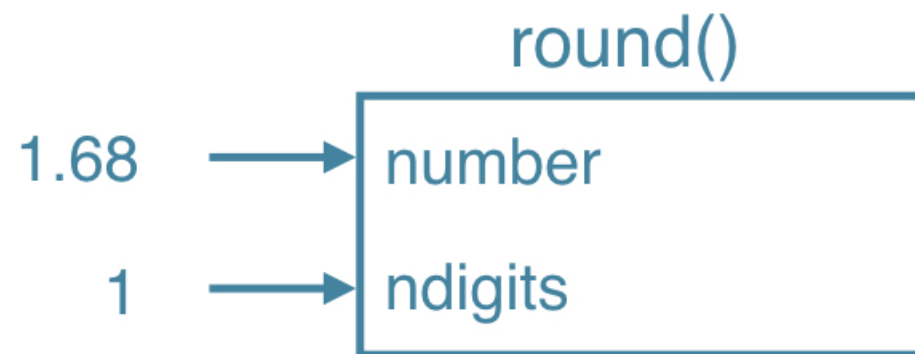
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`round(1.68, 1)`



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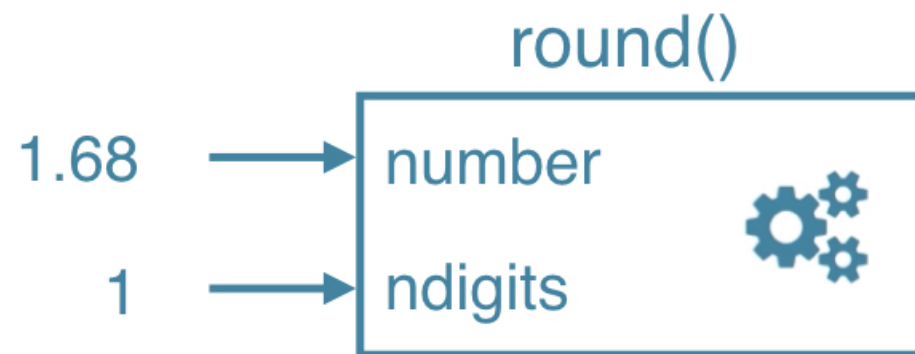
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`round(1.68, 1)`



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```

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round(...)
```

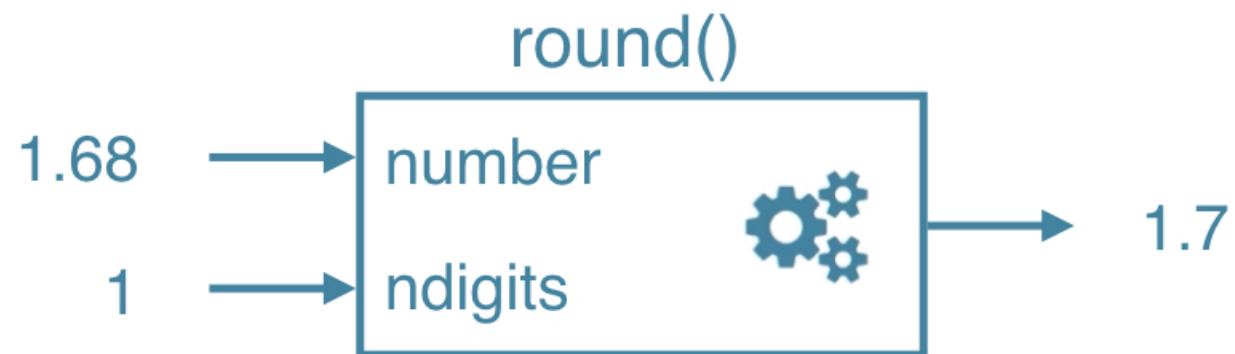
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`round(1.68, 1)`



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```
round(1.68)
```

```
round()
```



round()

```
help(round)
```

```
round(...)
```

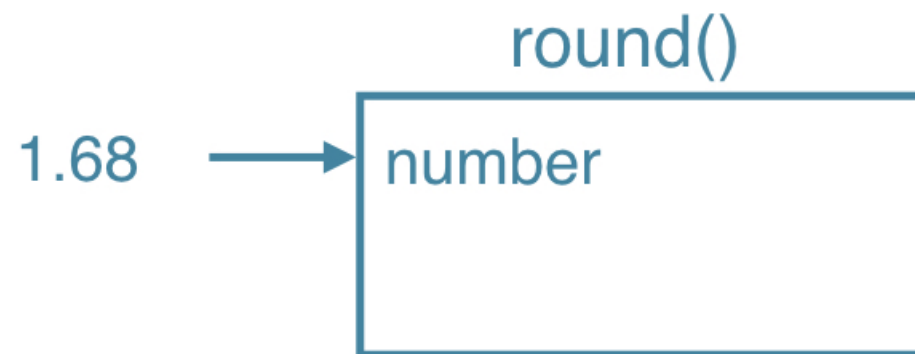
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round(1.68)



round()

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```
round(...)
```

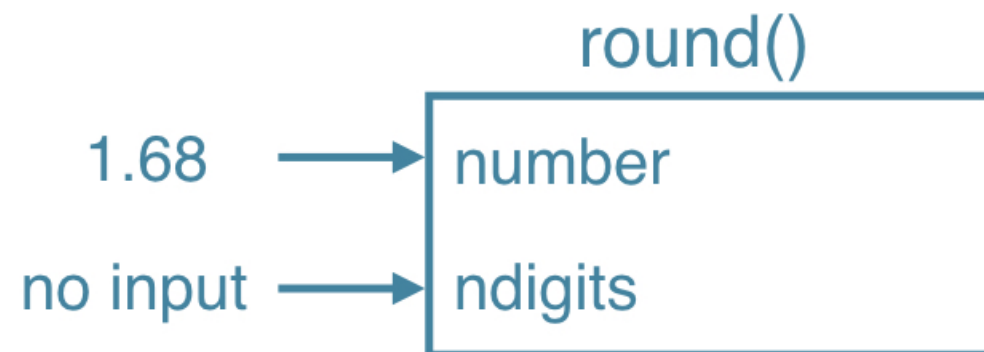
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round(1.68)



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```

```
round(...)
```

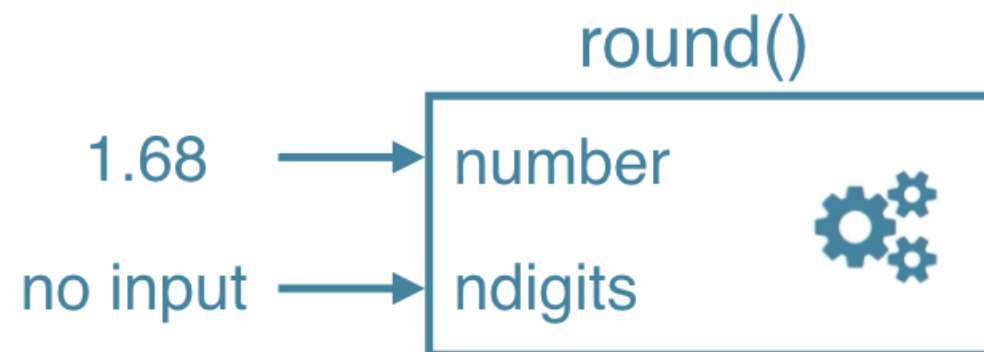
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round(number[, ndigits]) -> number
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round(1.68)



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```
round(...)
```

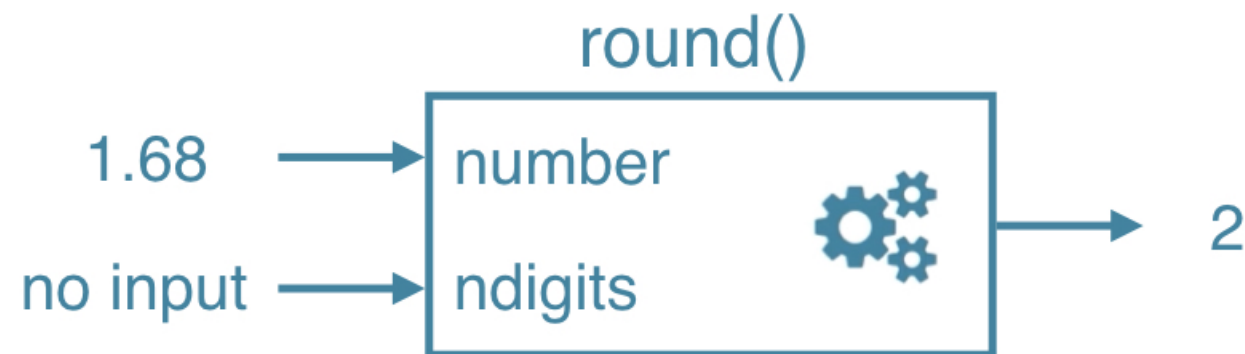
```
round(number[, ndigits]) -> number
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ndigits may be negative.

round(1.68)



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round(...)
```

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

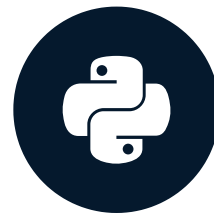
- `round(number)`
- `round(number, ndigits)`

Find functions

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

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"
```

	type
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

```
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() 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

```
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
```

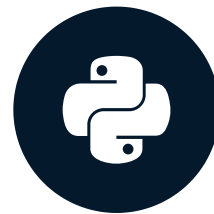
Methods: call functions on objects

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

```
6
```


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

- <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 define
```

```
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
```