

Hello Python!

INTRODUCTION TO PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

How you will learn

Learn / Courses / Introduction to Python

← Course Outline →

Light Mode

Exercise

Python as a calculator

Python is perfectly suited to do basic calculations. It can do addition, subtraction, multiplication and division.

The code in the script gives some examples.

Now it's your turn to practice!

Instructions

300 XP

- Print the sum of 5 + 5 .
- Print the result of subtracting 5 from 5 .
- Multiply 3 by 5 .
- Divide 10 by 2 .

Take Hint (-30 XP)

script.py

```
1 # Addition
2 print(5 + 5)
3
4 # Subtraction
5 print(5 - 5)
6
7 # Multiplication
8 print(3 * 5)
9
10 # Division
11
```

Run Code

Submit Answer

IPython Shell

In [1]:

Python



- General purpose: build anything
- Open source! Free!
- Python packages, also for data science
 - Many applications and fields

IPython Shell

Execute Python commands

Learn / Courses / Introduction to Python

← Course Outline →

Light Mode

Exercise

Python as a calculator

Python is perfectly suited to do basic calculations. It can do addition, subtraction, multiplication and division.

The code in the script gives some examples.

Now it's your turn to practice!

Instructions 100 XP

- Print the sum of `5 + 5`.
- Print the result of subtracting `5` from `5`.
- Multiply `3` by `5`.
- Divide `10` by `2`.

Take Hint (-30 XP)

script.py

```
1 # Addition
2
3
4 # Subtraction
5
6
7 # Multiplication
8
9
10 # Division
11
```

Run Code Submit Answer

IPython Shell

In [1]:

IPython Shell

Execute Python commands

Learn / Courses / Introduction to Python

← Course Outline →

Light Mode

Exercise

Python as a calculator

Python is perfectly suited to do basic calculations. It can do addition, subtraction, multiplication and division.

The code in the script gives some examples.

Now it's your turn to practice!

Instructions

100 XP

- Print the sum of `5 + 5`.
- Print the result of subtracting `5` from `5`.
- Multiply `3` by `5`.
- Divide `10` by `2`.

Take Hint (-30 XP)

script.py

```
1 # Addition
2
3
4 # Subtraction
5
6
7 # Multiplication
8
9
10 # Division
11
```

↶

Run Code

Submit Answer

IPython Shell

In [1]:

IPython Shell

Learn / Courses / Introduction to Python

Exercise

Python as a calculator

Python is perfectly suited to do basic calculations. It can do addition, subtraction, multiplication and division.

The code in the script gives some examples.

Now it's your turn to practice!

Instructions

100 XP

- Print the sum of `5 + 5`.
- Print the result of subtracting `5` from `5`.
- Multiply `3` by `5`.
- Divide `10` by `2`.

Take Hint (-30 XP)

script.py

Light Mode

1

↺

Run Code

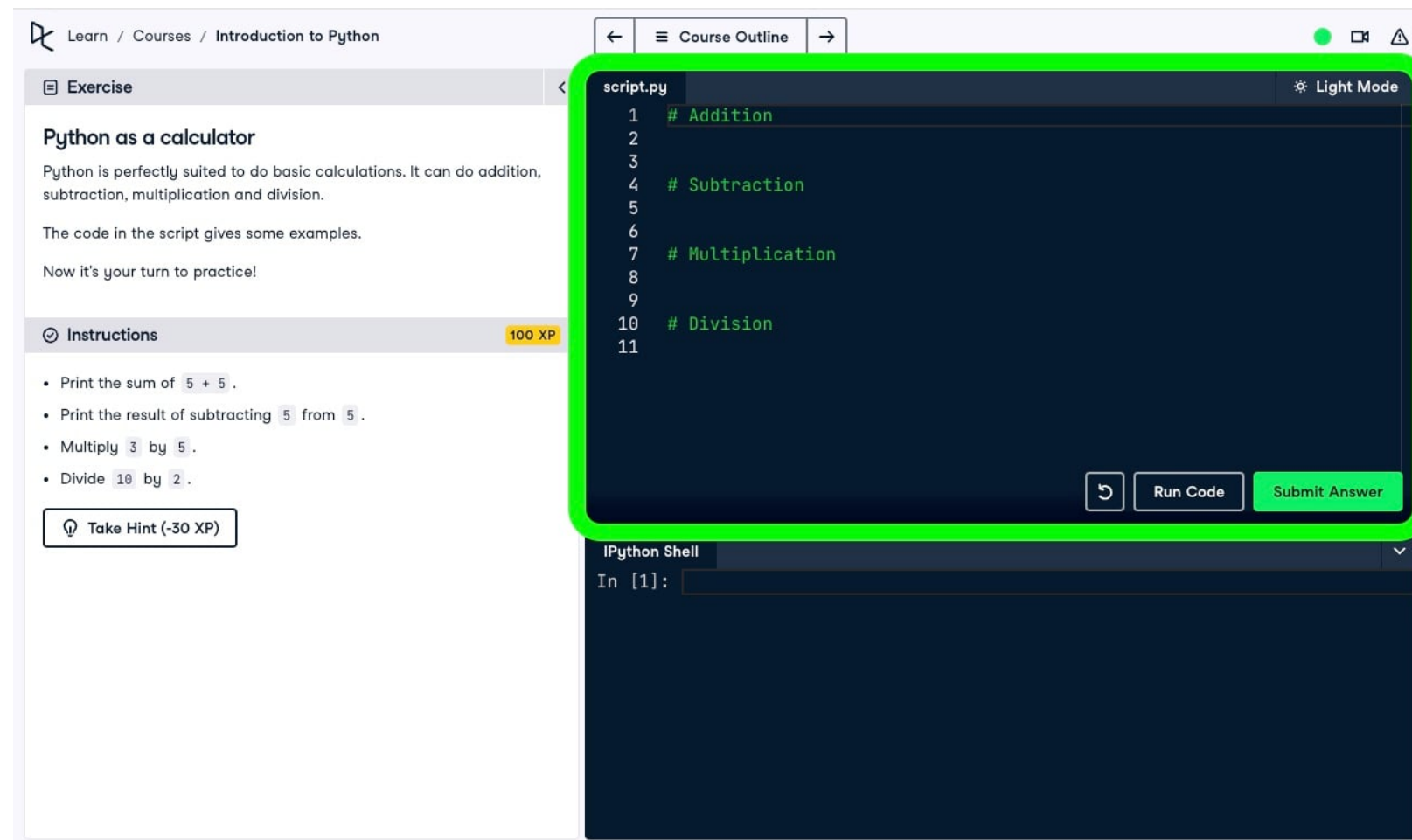
Submit Answer

IPython Shell

In [1]:

Python Script

- Text files - `.py`
- List of Python commands
- Similar to typing in IPython Shell



The screenshot shows a web-based interface for learning Python. On the left, there's a sidebar with a 'Learn / Courses / Introduction to Python' breadcrumb. Below it, an 'Exercise' section titled 'Python as a calculator' explains that Python can do basic calculations and provides instructions for a practice task. The instructions list four tasks: printing the sum of 5 + 5, subtracting 5 from 5, multiplying 3 by 5, and dividing 10 by 2. A 'Take Hint (-30 XP)' button is also present. The main area is a code editor for a file named 'script.py'. The code contains comments for addition, subtraction, multiplication, and division, with line numbers 1 through 11. At the bottom of the editor are buttons for 'Run Code' and 'Submit Answer'. Below the editor is an 'IPython Shell' with a prompt 'In [1]:'.

```
script.py
1  # Addition
2
3
4  # Subtraction
5
6
7  # Multiplication
8
9
10 # Division
11
```

Python Script

Learn / Courses / Introduction to Python

← Course Outline →

⬆ ⬇ ⬆

Exercise

Python as a calculator

Python is perfectly suited to do basic calculations. It can do addition, subtraction, multiplication and division.

The code in the script gives some examples.

Now it's your turn to practice!

Instructions 100 XP

- Print the sum of 4 + 5.
- Print the result of subtracting 5 from 5.
- Multiply 3 by 5.
- Divide 10 by 2.

Take Hint (-30 XP)

script.py Light Mode

1 4

⌂ Run Code Submit Answer

IPython Shell

In [1]:

Python Script

The screenshot shows a web interface for a Python exercise. The top navigation bar includes a logo, the path 'Learn / Courses / Introduction to Python', and a 'Course Outline' button. The left sidebar has a tab for 'Exercise' and a section titled 'Python as a calculator' with instructions: 'Python is perfectly suited to do basic calculations. It can do addition, subtraction, multiplication and division. The code in the script gives some examples. Now it's your turn to practice!'. Below this is an 'Instructions' section with a '100 XP' badge and a list of tasks: 'Print the sum of 4 + 5', 'Print the result of subtracting 5 from 5', 'Multiply 3 by 5', and 'Divide 10 by 2'. A 'Take Hint (-30 XP)' button is also present. The main area is split into two panes. The top pane, labeled 'script.py', shows a code editor with a single line '1' and buttons for 'Run Code' and 'Submit Answer'. The bottom pane, labeled 'IPython Shell', shows a prompt 'In [1]:'.

Learn / Courses / Introduction to Python

Exercise

Python as a calculator

Python is perfectly suited to do basic calculations. It can do addition, subtraction, multiplication and division.

The code in the script gives some examples.

Now it's your turn to practice!

Instructions 100 XP

- Print the sum of `4 + 5`.
- Print the result of subtracting `5` from `5`.
- Multiply `3` by `5`.
- Divide `10` by `2`.

Take Hint (-30 XP)

script.py

```
1
```

Run Code Submit Answer

IPython Shell

```
In [1]:
```

- Use `print()` to generate output from script

DataCamp Interface

Learn / Courses / Introduction to Python

←

≡ Course Outline

→

●

📺

⚠

Exercise

Python as a calculator

Python is perfectly suited to do basic calculations. It can do addition, subtraction, multiplication and division.

The code in the script gives some examples.

Now it's your turn to practice!

Instructions

100 XP

- Print the sum of 5 + 5 .
- Print the result of subtracting 5 from 5 .
- Multiply 3 by 5 .
- Divide 10 by 2 .

Take Hint (-30 XP)

script.py

Light Mode

```
1 # Addition
2
3
4 # Subtraction
5
6
7 # Multiplication
8
9
10 # Division
11
```

↺

Run Code

Submit Answer

IPython Shell

▼

In [1]:

Let's practice!

INTRODUCTION TO PYTHON

Variables and Types

INTRODUCTION TO PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

Variable

- Specific, case-sensitive name
- Call up value through variable name
- 1.79 m - 68.7 kg

```
height = 1.79  
weight = 68.7  
height
```

```
1.79
```

Calculate BMI

```
height = 1.79  
weight = 68.7  
height
```

```
1.79
```

$$\text{BMI} = \frac{\text{weight}}{\text{height}^2}$$

```
68.7 / 1.79 ** 2
```

```
21.4413
```

```
weight / height ** 2
```

```
21.4413
```

```
bmi = weight / height ** 2  
bmi
```

```
21.4413
```

Reproducibility

```
height = 1.79  
weight = 68.7  
bmi = weight / height ** 2  
print(bmi)
```

```
21.4413
```

Reproducibility

```
height = 1.79  
weight = 74.2 # <-  
bmi = weight / height ** 2  
print(bmi)
```

```
23.1578
```


Python Types

```
type(bmi)
```

```
float
```

```
day_of_week = 5  
type(day_of_week)
```

```
int
```

Python Types (2)

```
x = "body mass index"  
y = 'this works too'  
type(y)
```

str

```
z = True  
type(z)
```

bool

Python Types (3)

```
2 + 3
```

```
5
```

```
'ab' + 'cd'
```

```
'abcd'
```

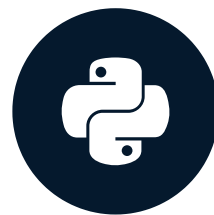
- Different type = different behavior!

Let's practice!

INTRODUCTION TO PYTHON

Python Lists

INTRODUCTION TO PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

Python Data Types

- float - real numbers
- int - integer numbers
- str - string, text
- bool - True, False

```
height = 1.73  
tall = True
```

- Each variable represents single value

Problem

- Data Science: many data points
- Height of entire family

```
height1 = 1.73  
height2 = 1.68  
height3 = 1.71  
height4 = 1.89
```

- Inconvenient

Python List

- `[a, b, c]`

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

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

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

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

- Name a collection of values
- Contain any type
- Contain different types

Python List

- `[a, b, c]`

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

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

```
fam2 = [{"liz", 1.73},  
        {"emma", 1.68},  
        {"mom", 1.71},  
        {"dad", 1.89}]  
fam2
```

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

List type

```
type(fam)
```

```
list
```

```
type(fam2)
```

```
list
```

- Specific functionality
- Specific behavior

Let's practice!

INTRODUCTION TO PYTHON

Subsetting Lists

INTRODUCTION TO PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

Subsetting lists

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

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

```
fam[3]
```

```
1.68
```

Subsetting lists

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

```
fam[6]
```

```
'dad'
```

```
fam[-1]
```

```
1.89
```

```
fam[7]
```

```
1.89
```

Subsetting lists

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

```
fam[6]
```

```
'dad'
```

```
fam[-1] # <-
```

```
1.89
```

```
fam[7] # <-
```

```
1.89
```

List slicing

```
fam
```

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

```
fam[3:5]
```

```
[1.68, 'mom']
```

```
fam[1:4]
```

```
[1.73, 'emma', 1.68]
```

[start : end]

inclusive

exclusive

List slicing

```
fam
```

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

```
fam[:4]
```

```
['liz', 1.73, 'emma', 1.68]
```

```
fam[5:]
```

```
[1.71, 'dad', 1.89]
```

Let's practice!

INTRODUCTION TO PYTHON

Manipulating Lists

INTRODUCTION TO PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

List Manipulation

- Change list elements
- Add list elements
- Remove list elements

Changing list elements

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

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

```
fam[7] = 1.86  
fam
```

```
['liz', 1.73, 'emma', 1.68, 'mom', 1.71, 'dad', 1.86]
```

```
fam[0:2] = ["lisa", 1.74]  
fam
```

```
['lisa', 1.74, 'emma', 1.68, 'mom', 1.71, 'dad', 1.86]
```

Adding and removing elements

```
fam + ["me", 1.79]
```

```
['lisa', 1.74, 'emma', 1.68, 'mom', 1.71, 'dad', 1.86, 'me', 1.79]
```

```
fam_ext = fam + ["me", 1.79]
```

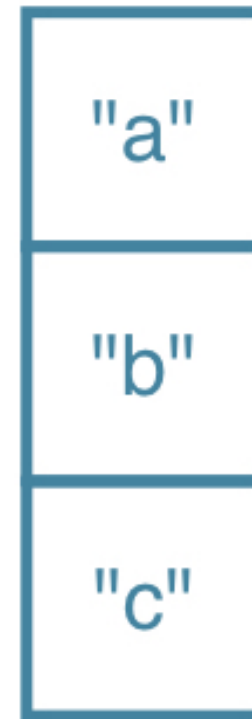
```
del fam[2]
```

```
fam
```

```
['lisa', 1.74, 1.68, 'mom', 1.71, 'dad', 1.86]
```

Behind the scenes (1)

```
x = ["a", "b", "c"]
```



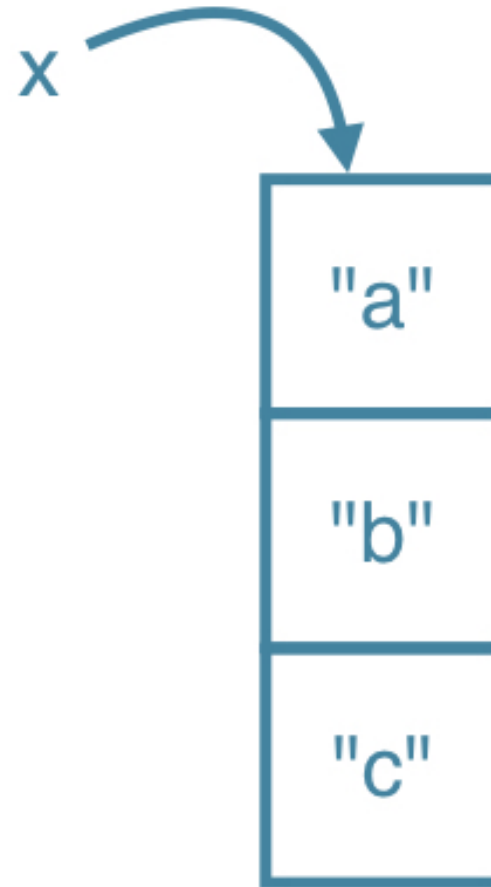
Behind the scenes (1)

```
x = ["a", "b", "c"]  
y = x  
y[1] = "z"  
y
```

```
['a', 'z', 'c']
```

```
x
```

```
['a', 'z', 'c']
```



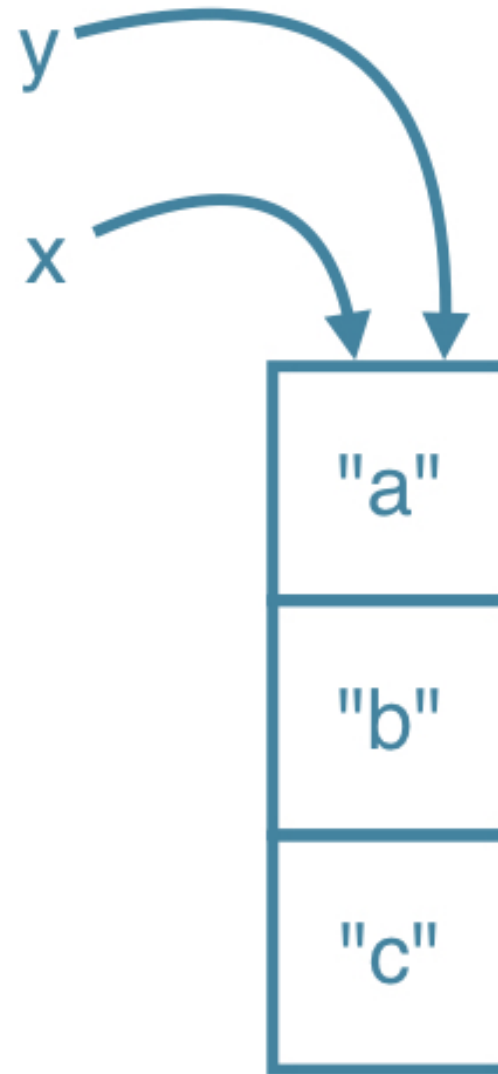
Behind the scenes (1)

```
x = ["a", "b", "c"]  
y = x  
y[1] = "z"  
y
```

```
['a', 'z', 'c']
```

```
x
```

```
['a', 'z', 'c']
```



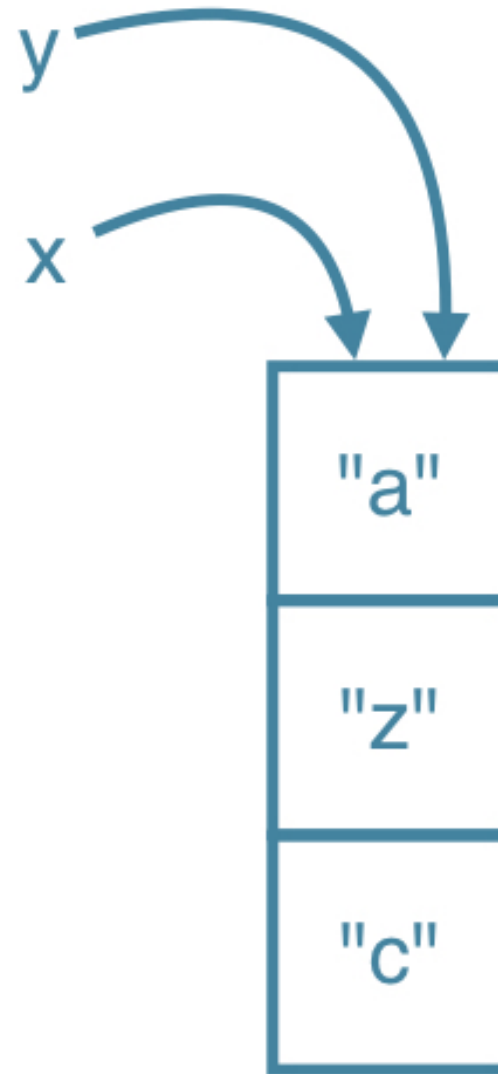
Behind the scenes (1)

```
x = ["a", "b", "c"]  
y = x  
y[1] = "z"  
y
```

```
['a', 'z', 'c']
```

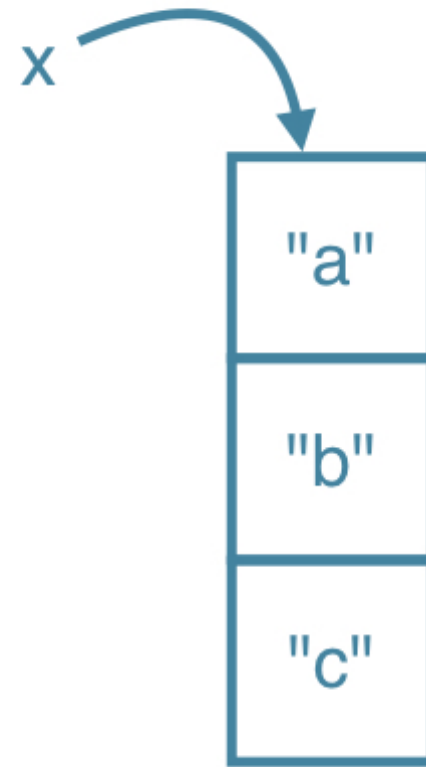
```
x
```

```
['a', 'z', 'c']
```



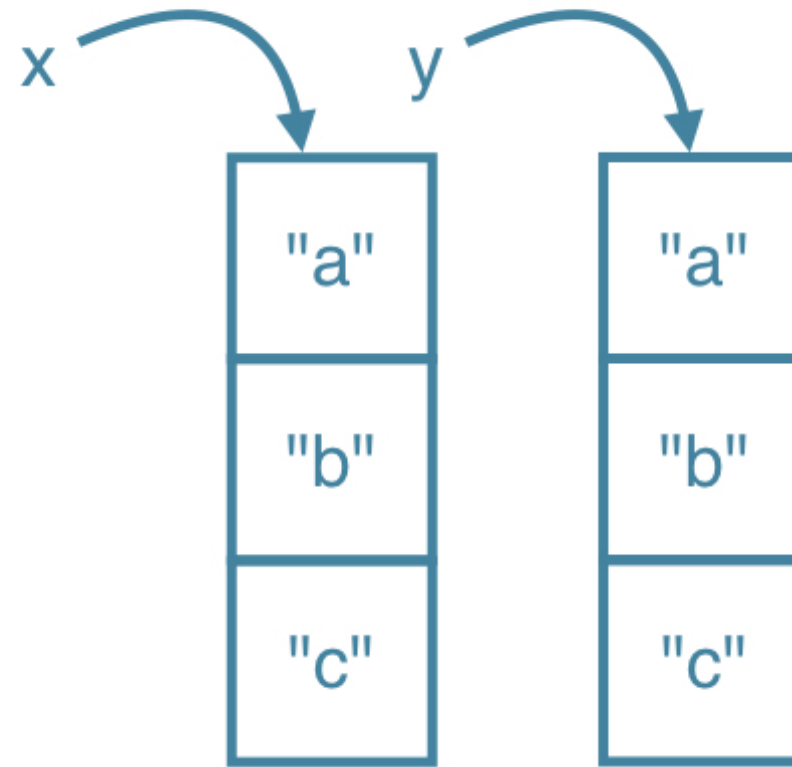
Behind the scenes (2)

```
x = ["a", "b", "c"]
```



Behind the scenes (2)

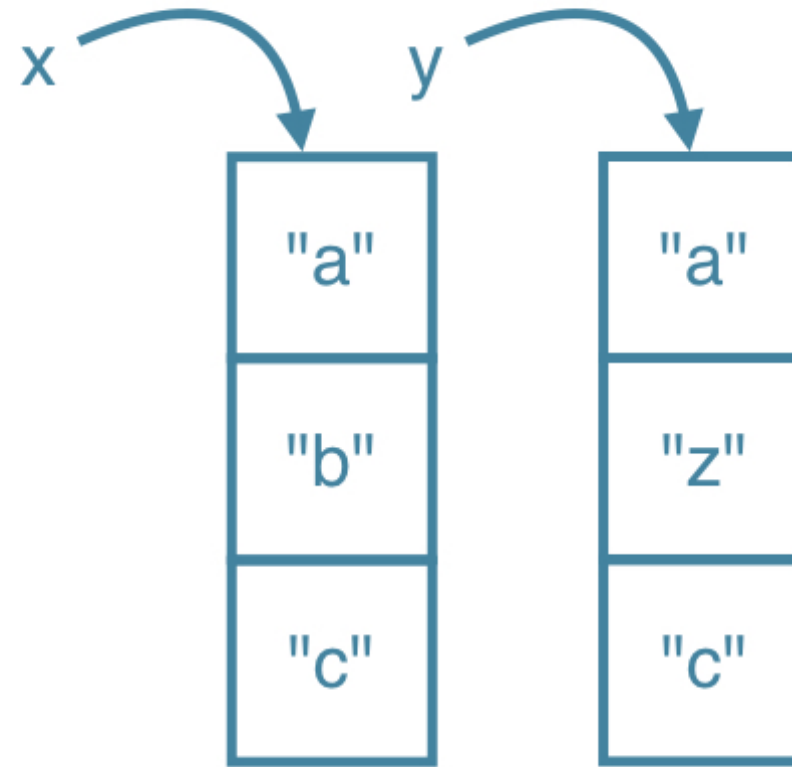
```
x = ["a", "b", "c"]  
y = list(x)  
y = x[:]
```



Behind the scenes (2)

```
x = ["a", "b", "c"]  
y = list(x)  
y = x[:]  
y[1] = "z"  
x
```

```
['a', 'b', 'c']
```

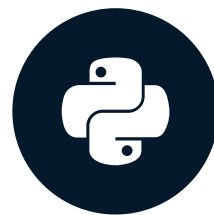


Let's practice!

INTRODUCTION TO PYTHON

Functions

INTRODUCTION TO PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

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
```



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
```

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.

round()

```
help(round)
```

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.

round()



round()

```
help(round)
```

Help on built-in function round in module builtins:

```
round(number, ndigits=None)
```

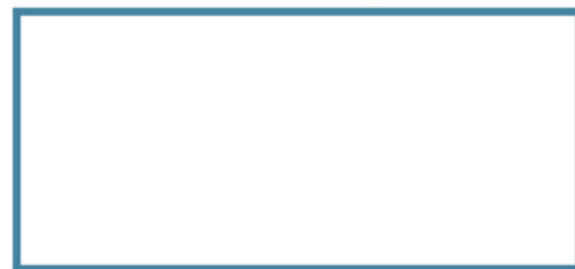
Round a number to a given precision in decimal digits.

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.

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

round()



round()

```
help(round)
```

Help on built-in function round in module builtins:

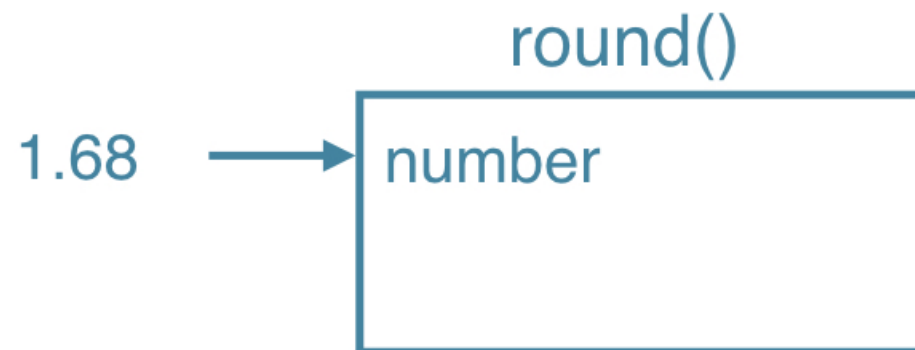
```
round(number, ndigits=None)
```

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.

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



round()

```
help(round)
```

Help on built-in function round in module builtins:

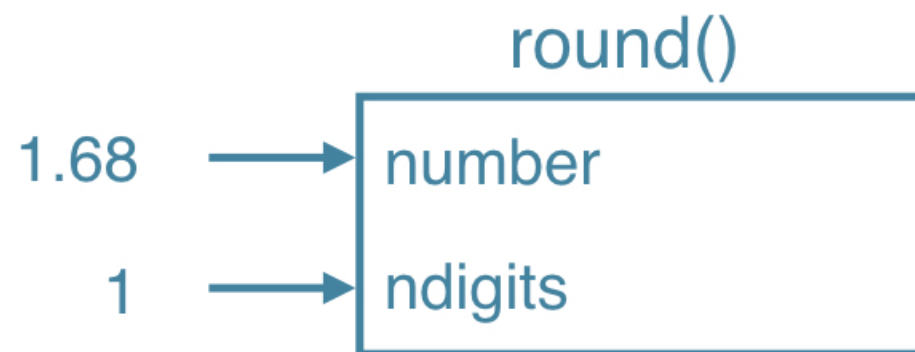
```
round(number, ndigits=None)
```

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.

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



round()

```
help(round)
```

Help on built-in function round in module builtins:

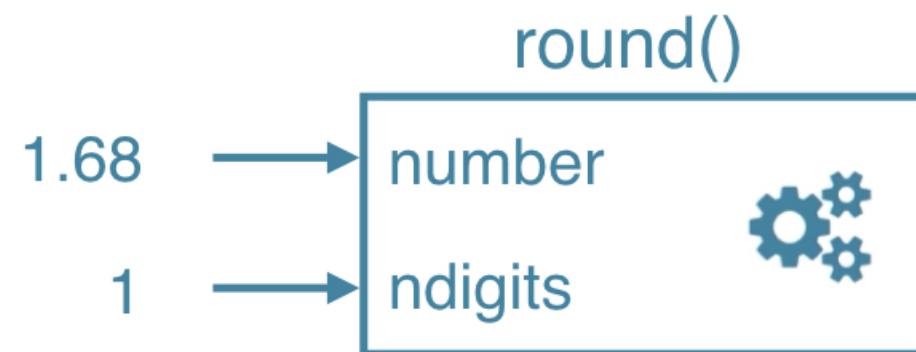
```
round(number, ndigits=None)
```

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.

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



round()

```
help(round)
```

Help on built-in function round in module builtins:

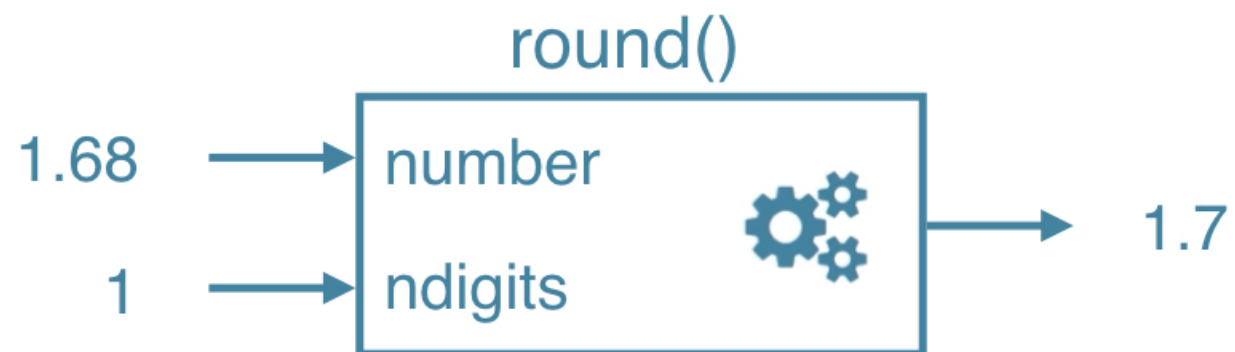
```
round(number, ndigits=None)
```

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.

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



round()

```
help(round)
```

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.

round()



round()

```
help(round)
```

Help on built-in function round in module builtins:

```
round(number, ndigits=None)
```

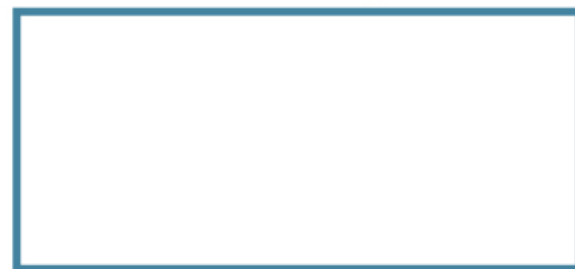
Round a number to a given precision in decimal digits.

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.

round(1.68)

round()



round()

```
help(round)
```

Help on built-in function round in module builtins:

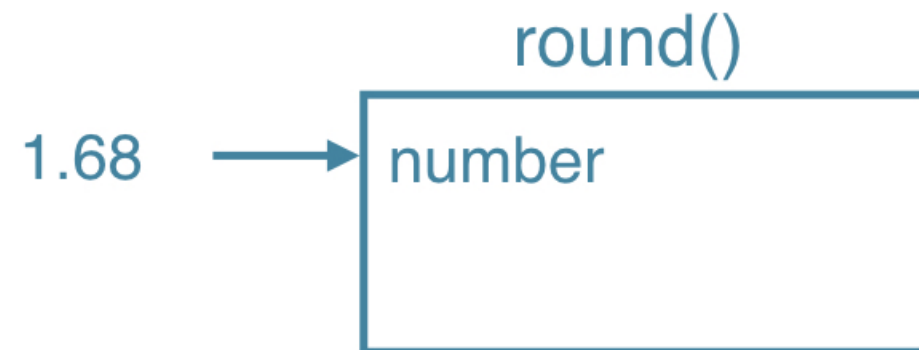
```
round(number, ndigits=None)
```

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.

round(1.68)



round()

```
help(round)
```

Help on built-in function round in module builtins:

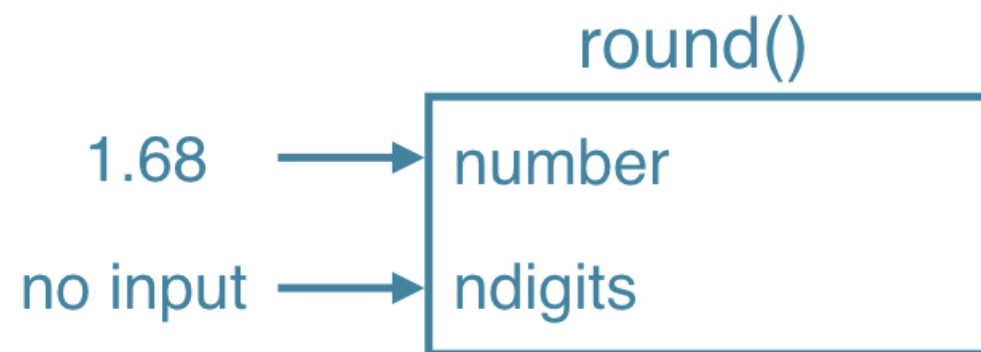
```
round(number, ndigits=None)
```

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.

round(1.68)



round()

```
help(round)
```

Help on built-in function round in module builtins:

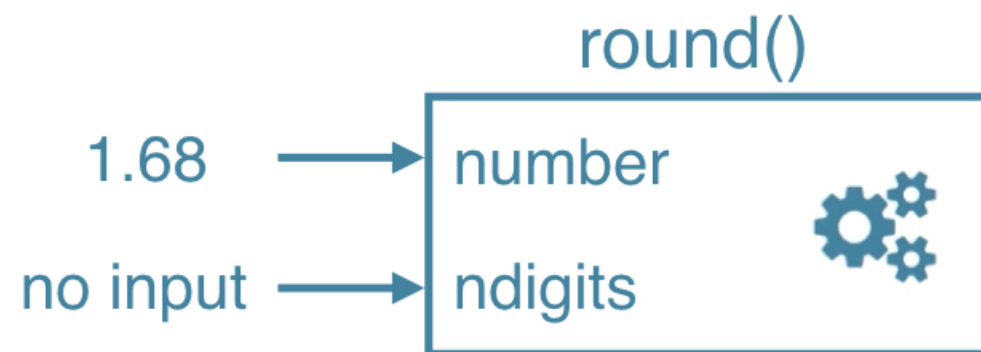
```
round(number, ndigits=None)
```

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.

round(1.68)



round()

```
help(round)
```

Help on built-in function round in module builtins:

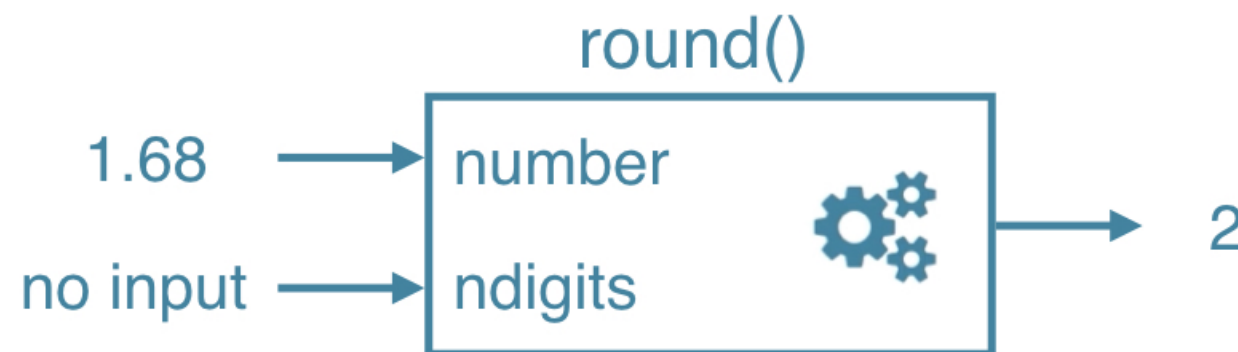
```
round(number, ndigits=None)
```

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.

round(1.68)



round()

```
help(round)
```

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.

- `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



Hugo Bowne-Anderson
Data Scientist at DataCamp

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]
```

- 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")
```

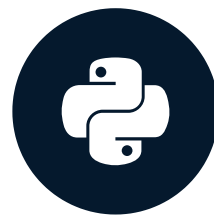
```
6
```

Let's practice!

INTRODUCTION TO PYTHON

Packages

INTRODUCTION TO PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

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

- 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!

INTRODUCTION TO PYTHON

NumPy

INTRODUCTION TO PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

Lists Recap

- Powerful
- Collection of values
- Hold different types
- Change, add, remove
- Need for Data Science
 - Mathematical operations over collections
 - Speed

Illustration

```
height = [1.73, 1.68, 1.71, 1.89, 1.79]  
height
```

```
[1.73, 1.68, 1.71, 1.89, 1.79]
```

```
weight = [65.4, 59.2, 63.6, 88.4, 68.7]  
weight
```

```
[65.4, 59.2, 63.6, 88.4, 68.7]
```

```
weight / height ** 2
```

```
TypeError: unsupported operand type(s) for ** or pow(): 'list' and 'int'
```

Solution: NumPy

- Numeric Python
- Alternative to Python List: NumPy Array
- Calculations over entire arrays
- Easy and Fast
- Installation
 - In the terminal: `pip3 install numpy`

NumPy

```
import numpy as np
np_height = np.array(height)
np_height
```

```
array([1.73, 1.68, 1.71, 1.89, 1.79])
```

```
np_weight = np.array(weight)
np_weight
```

```
array([65.4, 59.2, 63.6, 88.4, 68.7])
```

```
bmi = np_weight / np_height ** 2
bmi
```

```
array([21.85171573, 20.97505669, 21.75028214, 24.7473475 , 21.44127836])
```

Comparison

```
height = [1.73, 1.68, 1.71, 1.89, 1.79]  
weight = [65.4, 59.2, 63.6, 88.4, 68.7]  
weight / height ** 2
```

```
TypeError: unsupported operand type(s) for ** or pow(): 'list' and 'int'
```

```
np_height = np.array(height)  
np_weight = np.array(weight)  
np_weight / np_height ** 2
```

```
array([21.85171573, 20.97505669, 21.75028214, 24.7473475 , 21.44127836])
```

NumPy: remarks

```
np.array([1.0, "is", True])
```

```
array(['1.0', 'is', 'True'], dtype='<U32')
```

- NumPy arrays: contain only one type

NumPy: remarks

```
python_list = [1, 2, 3]  
numpy_array = np.array([1, 2, 3])
```

```
python_list + python_list
```

```
[1, 2, 3, 1, 2, 3]
```

```
numpy_array + numpy_array
```

```
array([2, 4, 6])
```

- Different types: different behavior!

NumPy Subsetting

```
bmi
```

```
array([21.85171573, 20.97505669, 21.75028214, 24.7473475 , 21.44127836])
```

```
bmi[1]
```

```
20.975
```

```
bmi > 23
```

```
array([False, False, False,  True, False])
```

```
bmi[bmi > 23]
```

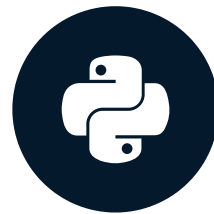
```
array([24.7473475])
```

Let's practice!

INTRODUCTION TO PYTHON

2D NumPy Arrays

INTRODUCTION TO PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

Type of NumPy Arrays

```
import numpy as np  
np_height = np.array([1.73, 1.68, 1.71, 1.89, 1.79])  
np_weight = np.array([65.4, 59.2, 63.6, 88.4, 68.7])
```

```
type(np_height)
```

```
numpy.ndarray
```

```
type(np_weight)
```

```
numpy.ndarray
```

2D NumPy Arrays

```
np_2d = np.array([[1.73, 1.68, 1.71, 1.89, 1.79],  
                  [65.4, 59.2, 63.6, 88.4, 68.7]])  
  
np_2d
```

```
array([[ 1.73,  1.68,  1.71,  1.89,  1.79],  
       [65.4 , 59.2 , 63.6 , 88.4 , 68.7 ]])
```

```
np_2d.shape
```

```
(2, 5) # 2 rows, 5 columns
```

```
np.array([[1.73, 1.68, 1.71, 1.89, 1.79],  
          [65.4, 59.2, 63.6, 88.4, "68.7"]])
```

```
array([[ '1.73', '1.68', '1.71', '1.89', '1.79'],  
       [ '65.4', '59.2', '63.6', '88.4', '68.7']], dtype='<U32')
```

Subsetting

	0	1	2	3	4	
array([[	1.73,	1.68,	1.71,	1.89,	1.79],	0
[	65.4,	59.2,	63.6,	88.4,	68.7]])	1

```
np_2d[0]
```

```
array([1.73, 1.68, 1.71, 1.89, 1.79])
```

Subsetting

	0	1	2	3	4	
array([[	1.73,	1.68,	1.71,	1.89,	1.79],	0
[	65.4,	59.2,	63.6,	88.4,	68.7]])	1

```
np_2d[0][2]
```

```
1.71
```

```
np_2d[0, 2]
```

```
1.71
```

Subsetting

	0	1	2	3	4	
array([[	1.73,	1.68,	1.71,	1.89,	1.79],	0
[	65.4,	59.2,	63.6,	88.4,	68.7]])	1

```
np_2d[:, 1:3]
```

```
array([[ 1.68,  1.71],  
       [59.2 , 63.6 ]])
```

```
np_2d[1, :]
```

```
array([65.4, 59.2, 63.6, 88.4, 68.7])
```


Let's practice!

INTRODUCTION TO PYTHON

NumPy: Basic Statistics

INTRODUCTION TO PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

Data analysis

- Get to know your data
- Little data -> simply look at it
- Big data -> ?

City-wide survey

```
import numpy as np
np_city = ... # Implementation left out
np_city
```

```
array([[1.64, 71.78],
       [1.37, 63.35],
       [1.6 , 55.09],
       ...,
       [2.04, 74.85],
       [2.04, 68.72],
       [2.01, 73.57]])
```

NumPy

```
np.mean(np_city[:, 0])
```

```
1.7472
```

```
np.median(np_city[:, 0])
```

```
1.75
```

NumPy

```
np.corrcoef(np_city[:, 0], np_city[:, 1])
```

```
array([[ 1.        , -0.01802],  
       [-0.01803,  1.        ]])
```

```
np.std(np_city[:, 0])
```

```
0.1992
```

- `sum()`, `sort()`, ...
- Enforce single data type: speed!

Generate data

- Arguments for `np.random.normal()`
 - distribution mean
 - distribution standard deviation
 - number of samples

```
height = np.round(np.random.normal(1.75, 0.20, 5000), 2)
```

```
weight = np.round(np.random.normal(60.32, 15, 5000), 2)
```

```
np_city = np.column_stack((height, weight))
```

Let's practice!

INTRODUCTION TO PYTHON