NumPy basics

SHARP SIGHT

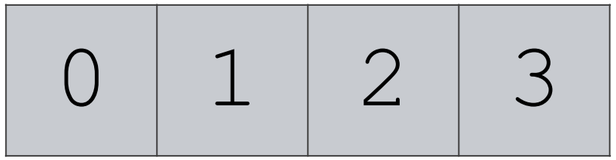
What you'll learn

- What NumPy arrays are
- How to import NumPy
- How to create simple arrays with `np.array()`
- The basics of array axes
- What array attributes are and how to retrieve them

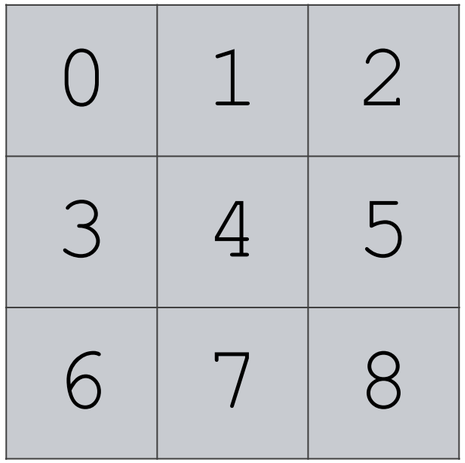
What is NumPy

NumPy arrays are objects that contain numeric data

1-dimensional array



2-dimensional array



NumPy is a toolkit for working with arrays of numeric data

- Create arrays
  - create simple arrays
  - create arrays based on probability distributions
  - create arrays with other numerical properties

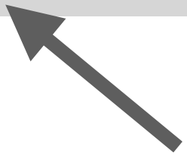
- Perform mathematical operations on arrays

- Combine and reshape arrays

How to import NumPy

How to import NumPy

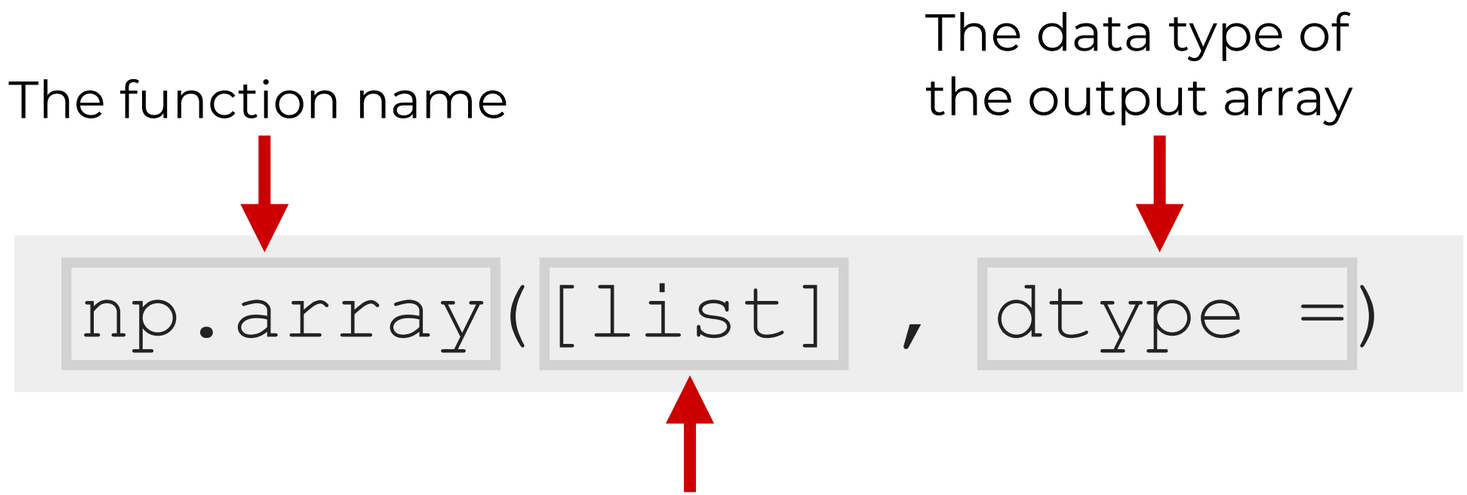
```
import numpy as np
```



Here, `np` serves as a "nickname" that we can use in our code

How to create a simple NumPy array with `np.array()`

Syntax: the np.array function

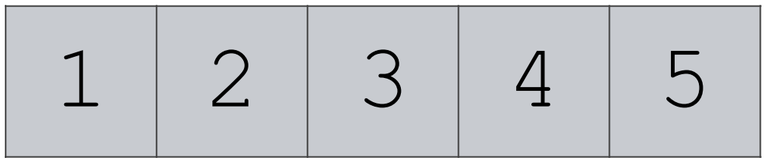


Example: create a 1-d array with np.array

```
np_array_1d = np.array([1,2,3,4,5])

print(np_array_1d)
```

OUT:



Example: create a 1-d array with np.array, with a specific data type

```
np_array_1d = np.array([1,2,3,4,5], dtype = float)

print(np_array_1d)
```

OUT:

1.	2.	3.	4.	5.

NumPy array attributes

NumPy arrays have a variety of attributes that describe them

Attribute	What it is
`size`	The number of elements in the array
`shape`	The number of rows, columns, etc
`ndim`	The number of dimensions
`dtype`	The data type of the elements

Examples: attributes of arrays

0	1	2

```
size      3
shape   (3,)
ndim      1
dtype   int
```

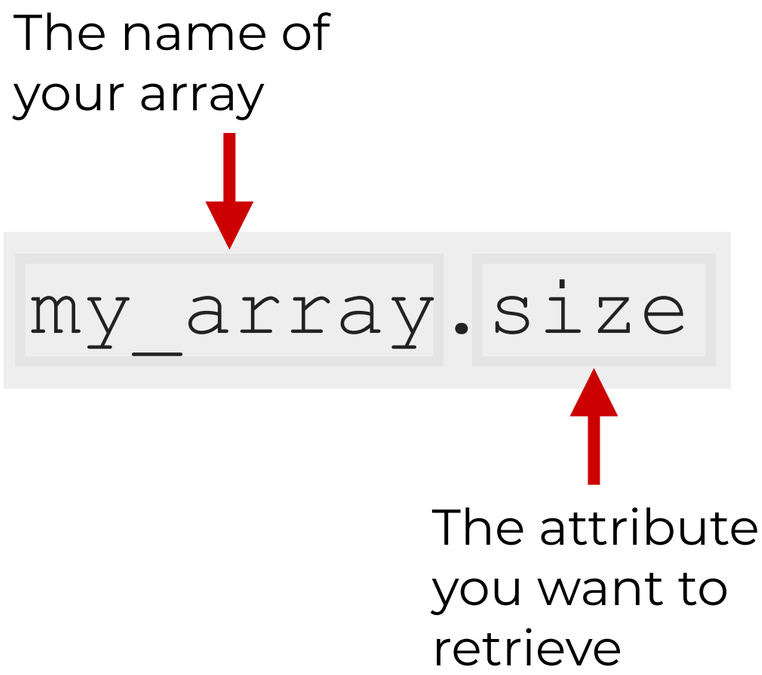
0	1	2
3	4	5

```
size      6
shape   (2,3)
ndim      2
dtype   int
```

0.5	1.6
2.7	3.8

```
size      4
shape   (2,2)
ndim      2
dtype   float
```

We can retrieve attributes by using "dot" notation after the array name



Examples: how to retrieve array attributes

Create the array →

Retrieve array attributes →

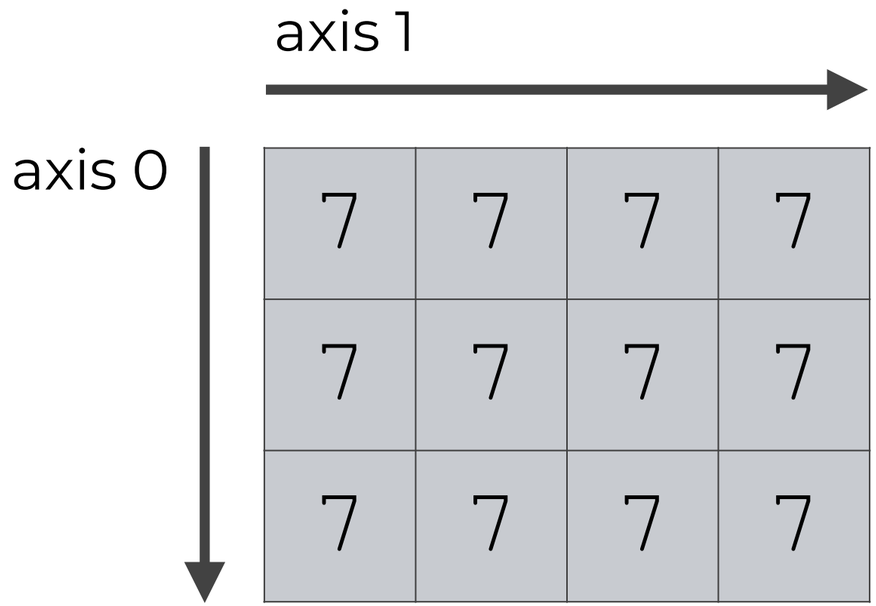
```
array_1 = np.array([0,1,2])


array_1.size
3


array_1.shape
(3,)
```

NumPy array axes

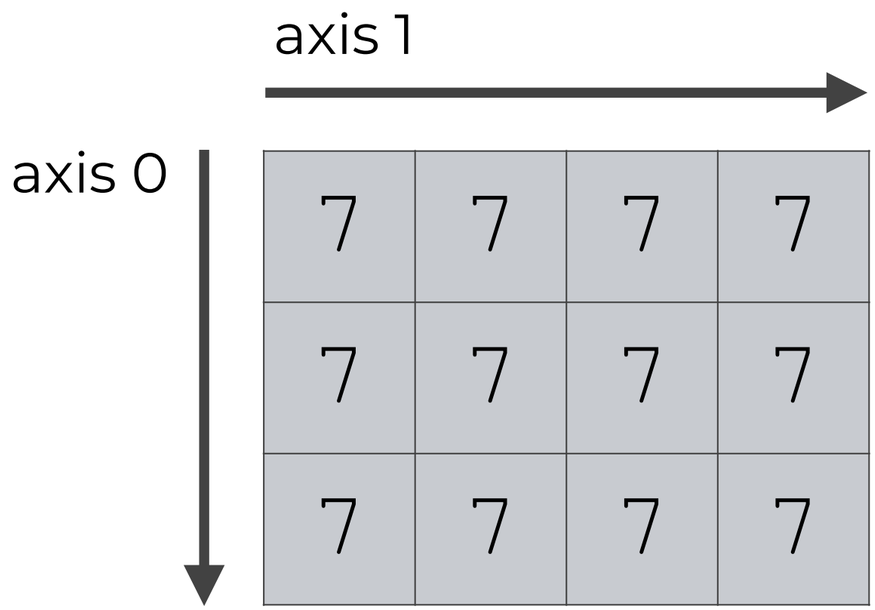
NumPy arrays have *axes*



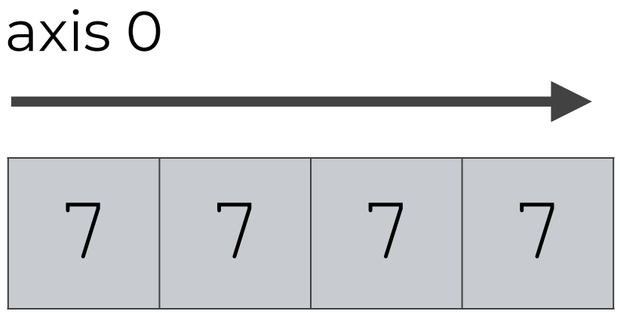
Axes are like *directions* along a NumPy array

Axis-1 is the direction that runs horizontally across the columns

Axis-0 is the direction that runs downward down the rows



But, in a 1-dimensional array, the first axis is axis-0



Just remember, 1-dimensional arrays are a little different

NumPy axes are important!

- We will use axes when we use many functions
  - `np.sum()`
  - `np.mean()`
  - `np.concatenate()`
  - etc

- Make sure you understand them!

Recap

Recap of what we learned

- NumPy arrays are arrays of numeric data
  - similar to vectors and matrices in mathematics
- How to import NumPy
- Use `np.array()` to create simple NumPy arrays
- NumPy arrays have attributes
  - `size`, `shape`, `ndim`, etc
- Array axes