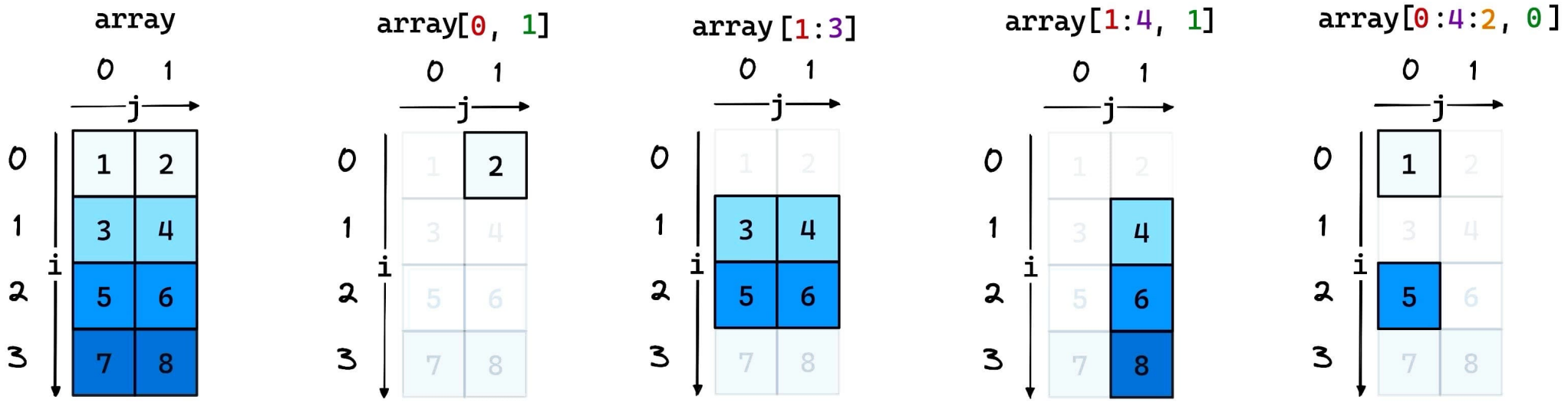
# Understanding Indexing, slicing & striding in NumPy!🚀




Step by step explanation with code!

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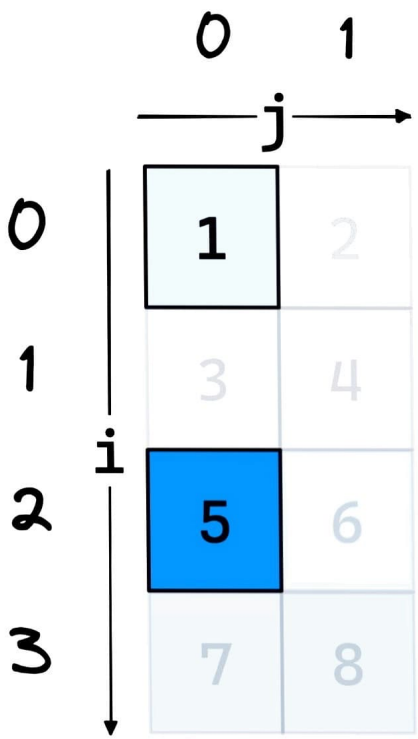
# Understanding the Syntax!🚀

```
array[0:4:2, 0]
```




```
array[0:4:2, 0]
```

0: Start index along the first axis (i)

4: Stop index along first axis, The element at this index is not included in the slice

2: This is the step size. It determines the stride between each element selected in the slice

0: This refers to the index along the second axis (j).

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[1]:
```
import numpy as np
```

## ✅ Basic Indexing

[2]:
```
# A regular 1D array
x = np.arange(10)
print(x[0])
print(x[-3])
```

```
0
7
```

[3]:
```
# Let's reshape x and make it a 2D array
x.shape = (2, 5)
print(x)
```

```
[[0 1 2 3 4]
 [5 6 7 8 9]]
```

[4]:
```
# No need to separate each dimension's index into its own set of square brackets.
# check this out 👇
print(x[1, 3])
print(x[1, -1])
```

```
8
9
```

[5]:
```
# If number of indices passed is fewer than the dimension of array
# A sub dimensional array is obtained 👇
x[0]
```

[5]:
```
array([0, 1, 2, 3, 4])
```

## ✳️ Slicing and striding

[6]:
```
# The basic slice syntax is i:j:k where i is the starting index,
# j is the stopping index, and k is the step (k should be non-zero)
# Consider 👇
x = np.array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
x[1:7:2]
```

[6]:
```
array([1, 3, 5])
```

[7]:
```
# Negative i and j are interpreted as n + i and n + j where n is the
# number of elements in the corresponding dimension.
print(x[-3:10]) # i = -3; j = 10; k = 1 (if not given k defaults to 1)
```

```
[7 8 9]
```

[8]:
```
# Negative k makes stepping go towards smaller indices
print(x[-3:3:-1]) # i = -3; j = 3; k = -1
```

```
[7 6 5 4]
```

[9]:
```
# If i is not given it defaults to 0 for k > 0 and n - 1 for k < 0 .
print(x[:5])
```

```
[0 1 2 3 4]
```

[10]:
```
# If j is not given it defaults to n for k > 0 and -n-1 for k < 0 .
print(x[5:])
```

```
[5 6 7 8 9]
```

[11]:
```
# Let's reverse the array
 # Since, k < 0; i not given it defaults to 10 - 1; j becomes -11
print(x[::-1]) # ↩️ is equivalent to x[10:-11:-1]; check next shell ⬇️
```

```
[9 8 7 6 5 4 3 2 1 0]
```

[12]:
```
x[10:-11:-1]
```

[12]:
```
array([9, 8, 7, 6, 5, 4, 3, 2, 1, 0])
```

## ✅ Integer array indexing

[13]:
```
x = np.arange(10, 1, -1)
x
```

[13]:
```
array([10,  9,  8,  7,  6,  5,  4,  3,  2])
```

[14]:
```
# One can directly access the elements at indices
# specified by integer array; Check this out 👇
x[np.array([3, 3, -3, 8])]
```

[14]:
```
array([7, 7, 4, 2])
```

## ✅ Boolean array Indexing

[15]:
```
# When boolean array is used, indices corresponsing to True values
# in boolean array are accessed from array x
x = np.array([1., -1., -2., 3])

# a booelan array 👇
x < 0 # ↩️ True where elements in x < 0
```

[15]:
```
array([False,  True,  True, False])
```

[16]:
```
# accessing the elements based on booelan array
x[x<0]
```

[16]:
```
array([-1., -2.])
```

[17]:
```
# adding 20 to all elements < 0
x[x < 0] += 20
x
```

[17]:
```
array([ 1., 19., 18.,  3.])
```