NumPy

→ Numpy is a python library that provides a simple yet powerful data structure : n-dimensional array

[1, 2, 3, 4]
List

[[1, 2, 3], [3, 4, 5]]
list of lists.

In numpy we have n-D array (ndarray)

→ On top of numpy most of powerful Python datascience tool is built. Ex: scipy, scikit-learn (sklearn)

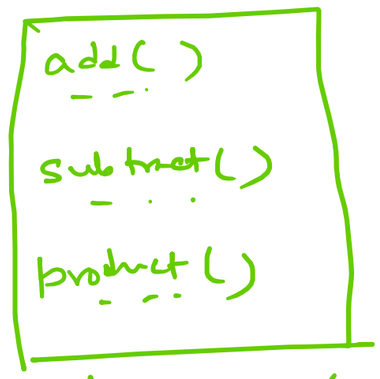
Benefit of using Numpy :-

(1) More speed : Numpy executes faster because it is internally built in C.

(2) Fewer loops :- Numpy offers vectorization which greatly reduce loops overhead.

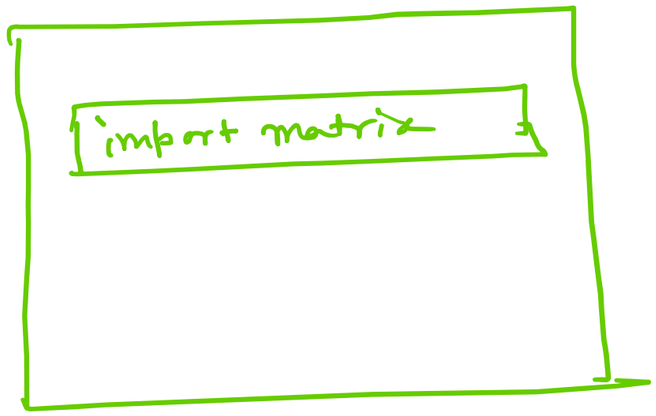
(3) Open source Community :

What is a library in the context of python



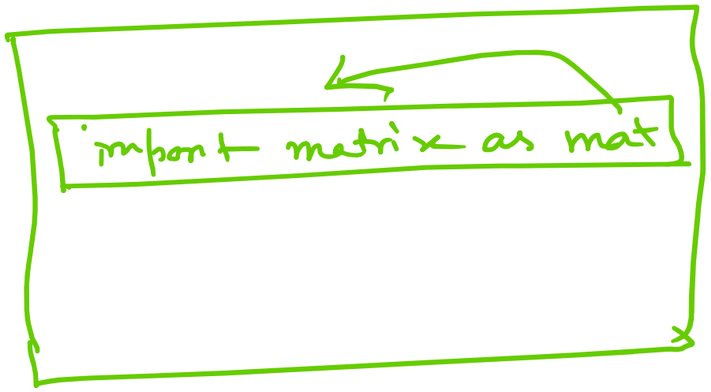
python file.

matrix.py



matrix.add(. . .)

matrix.product( )



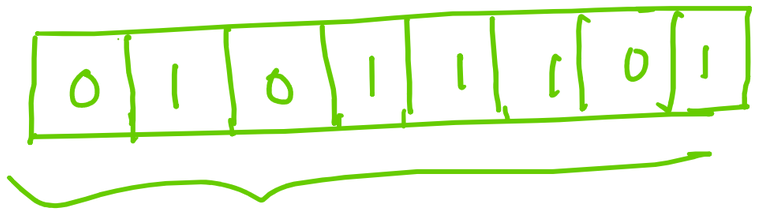
mat.add( )

mat.product( )

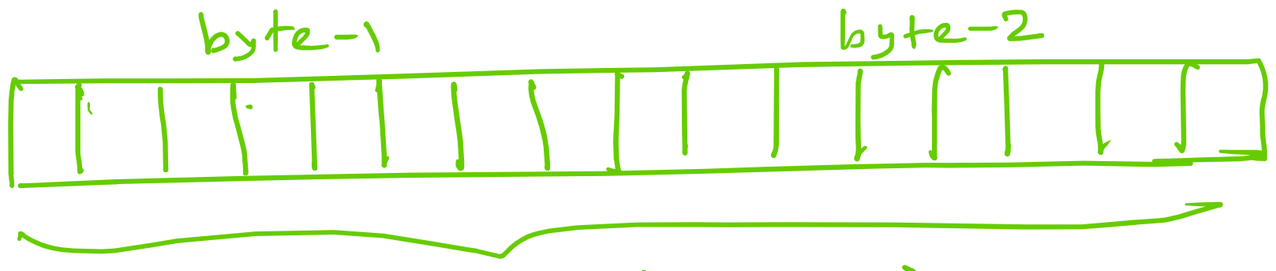
'mat' is alias of "matrix"

import numpy.as np

np is alias of- numpy.



8-bits (1 byte)



16-bits (2 bytes)

32 bits → 4 bytes.

64 bits → 8 bytes.

np.array([1, 2, 3])

int32, 8 bits (1 byte)

123 · 321765723519

np.array([1, 2, 3], dtype = np.int8)

int8

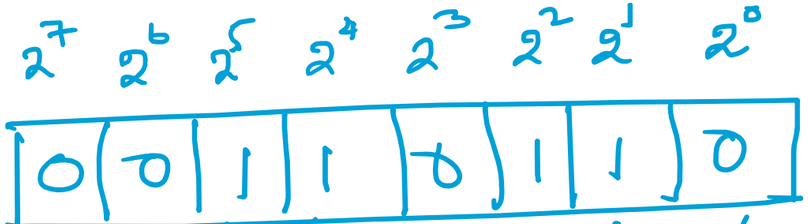
8 bit unsigned integer

one can store value up to 255

0, 1, 2, ... , 255

0, 1 → base-2 numbers.

(base 2) Boolean	Decimal (base 10)
0	0
1	1
10	2
11	3
100	4
101	5
110	6
111	7
1000	8
1001	9
1010	10
⋮	⋮



$0 + 0 + 1\times2^5 + 1\times2^4 + 0 + 1\times2^3 + 1\times2^2 + 1\times2^1 + 0\times2^0$

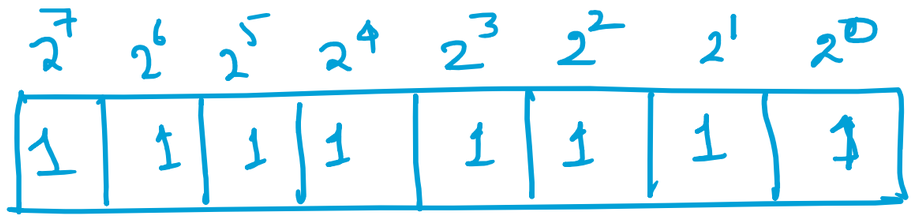
$32 + 16 + 4 + 2$

54.

2^3	2^2	2^1	2^0
1	0	0	0

$8 + 0 + 0 + 0 = 8$

$10000 \rightarrow 16$



$2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2 + 1$

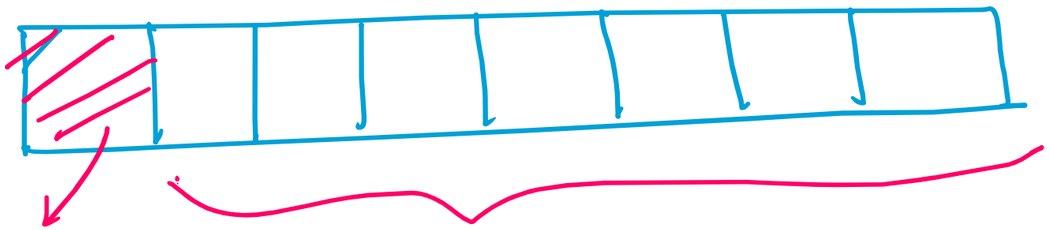
$= 255$

$2^8 - 1 = 256 - 1 = 255$

n-bit number

unsigned	signed
$2^n - 1$	-2^{n-1} to $+(2^{n-1} - 1)$

signed numbers (+ve / -ve)

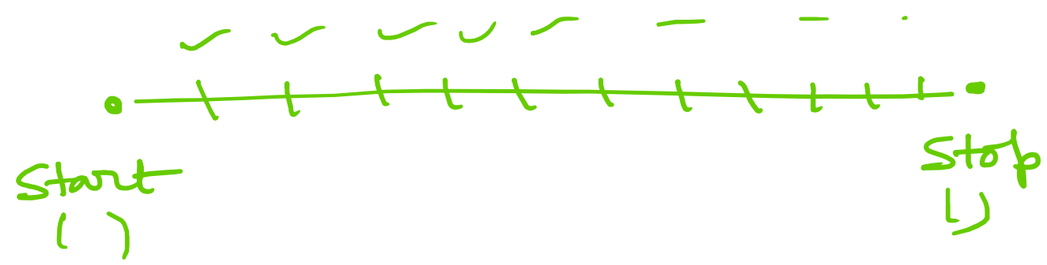


-128 to $+127$

-2^{8-1} to $(2^{8-1} - 1)$

$= -2^7$ to $(2^7 - 1)$ ⟶ -128 to $+127$

numpy.linspace



num → the numbers you want between start & stop.

np.linspace(start=0, stop=20, num=11)

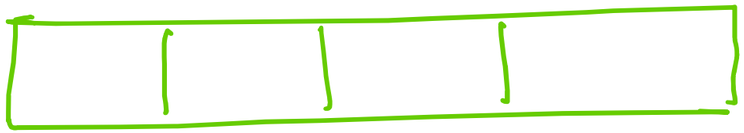
0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

2 2 2 2

common difference (d)

$$d = \frac{stop - start}{num - 1}$$

a =

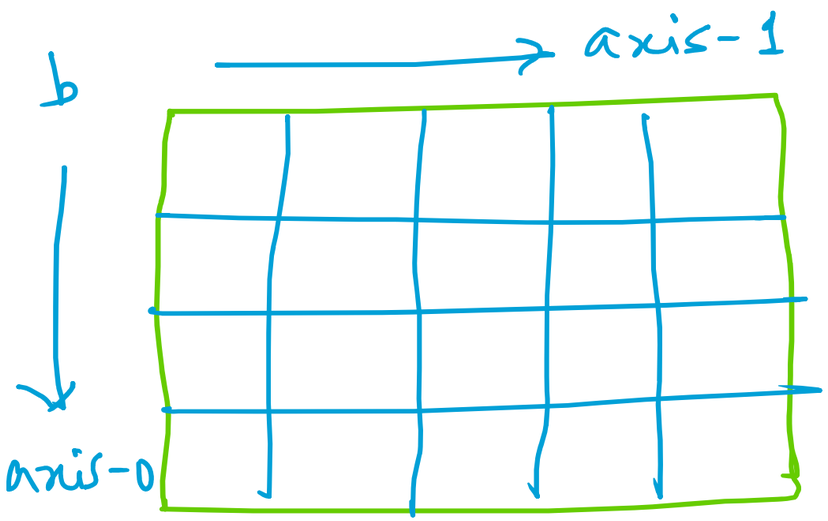


axis-0

1-D array

a.shape = (4,)

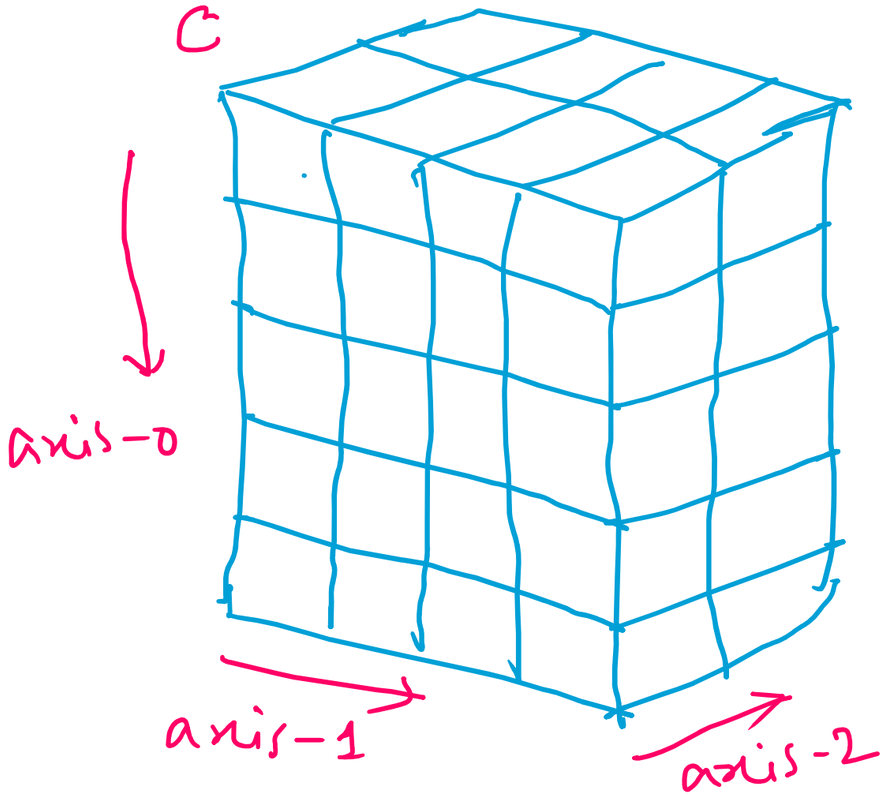
b



2-D array

b.shape = (4, 5)

C



C.shape = (5, 4, 2)

3-d array.

x

1 →

0 ↓

2	3	4
9	8	7

x.shape
(2,3)

y →

→ 1

0 ↓

2	3
4	9
8	7

x.reshape (3,2) → y

2 →

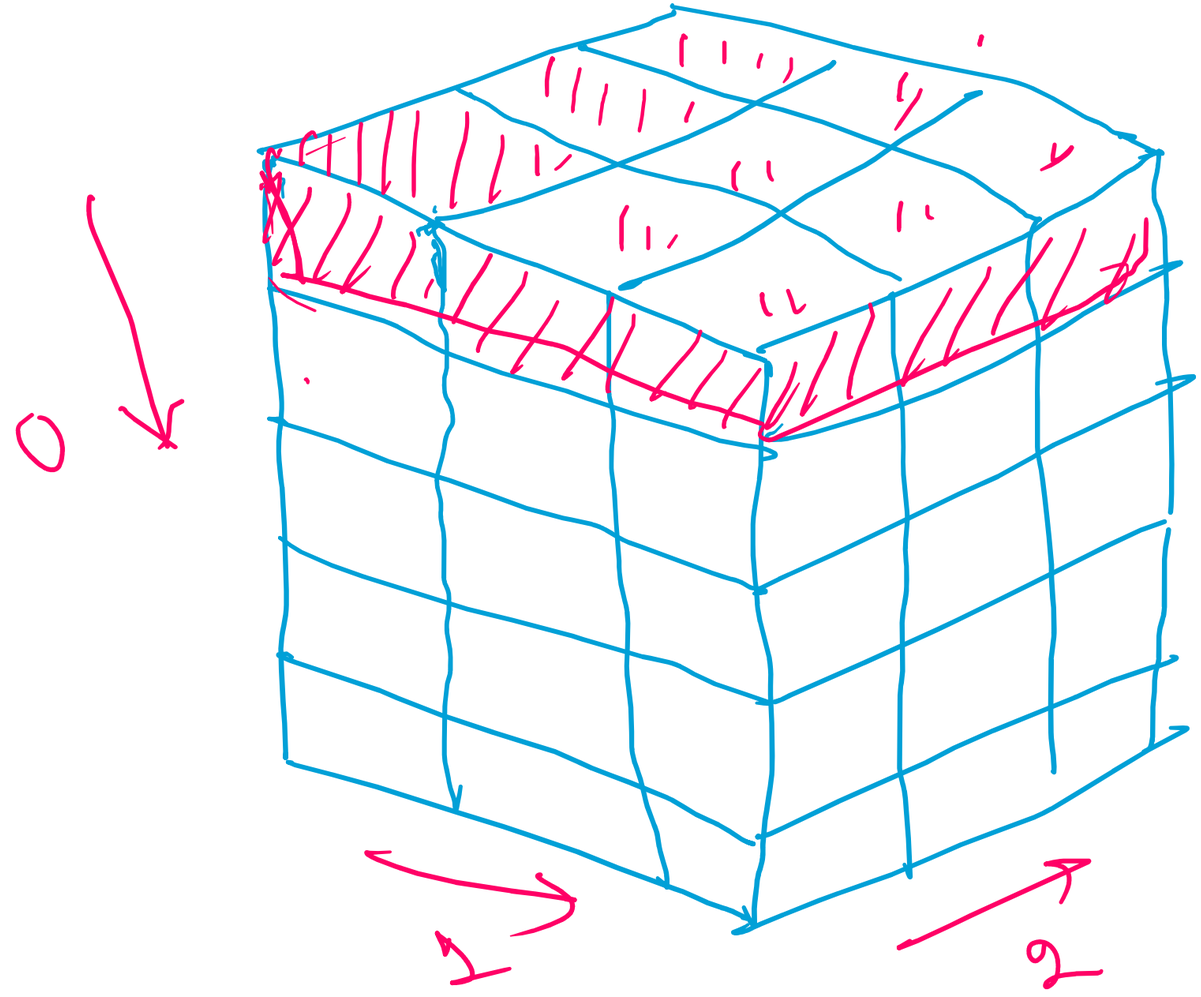
0 ↓

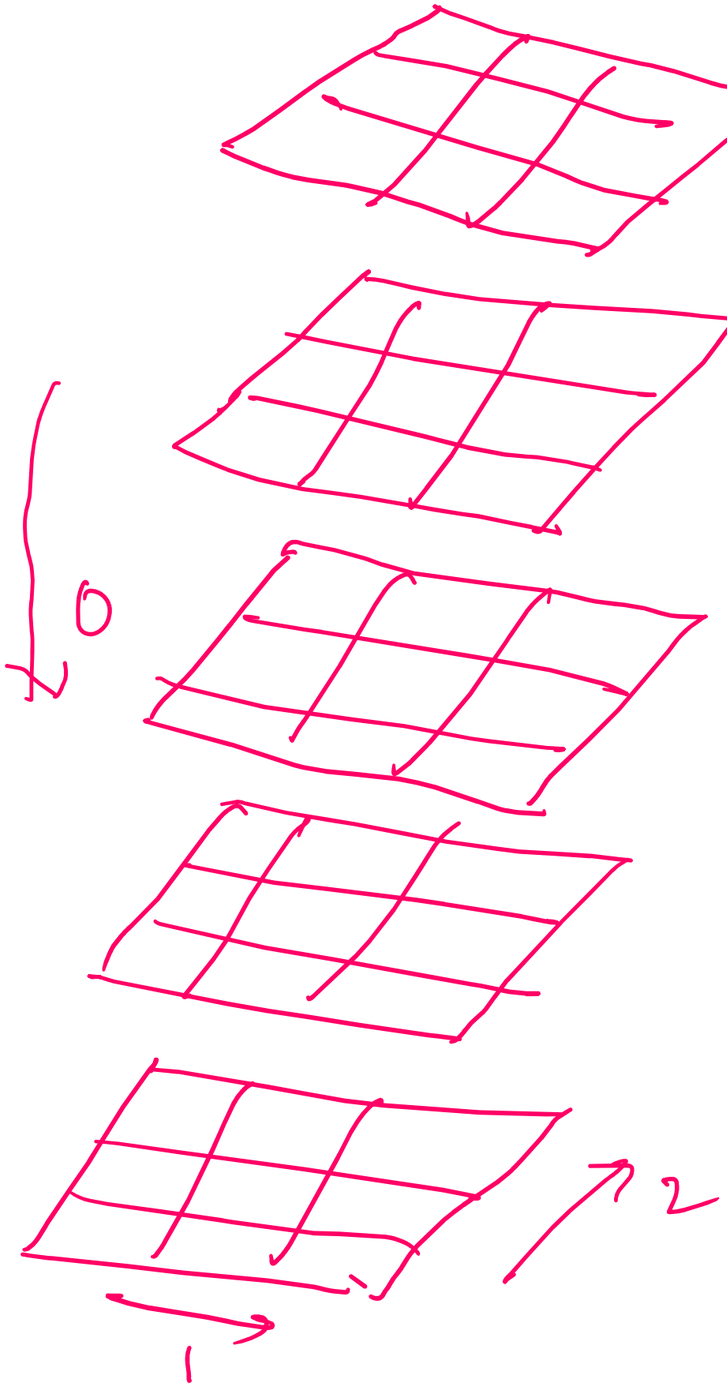
0	3	6
27	30	33

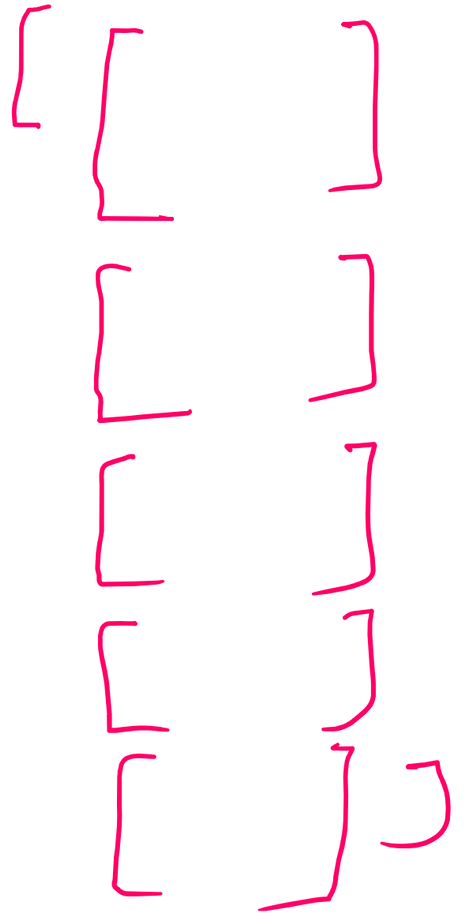
1 →

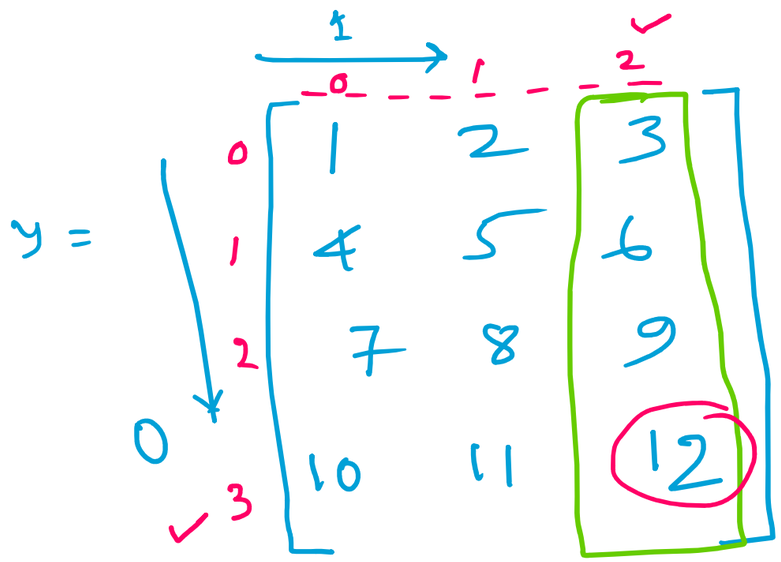
9	12	15
36	39	42

18	21	24
45	48	51


0
1
2


0
1
2





$y[:, 2]$ → along axis-1 consider only index-2

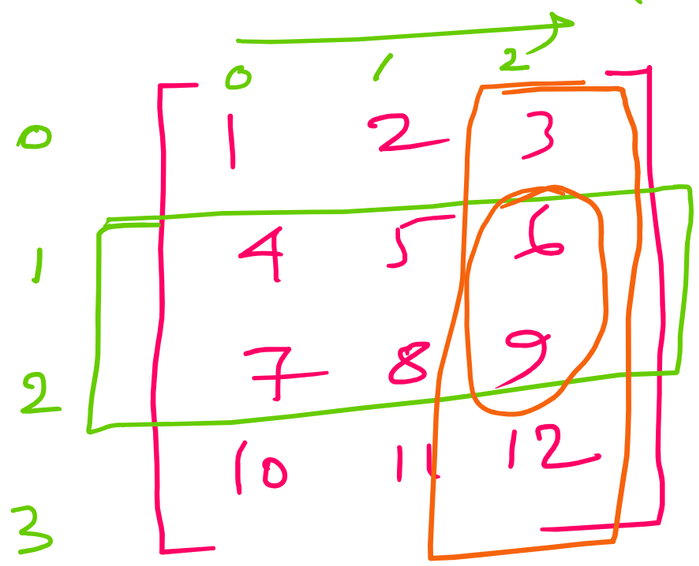
along axis-0 consider all indices.

$x = [1, 2, 3, 4, 6, 7]$ (indices 0, 1, 2, 3, 4, 5)

$x[-1] = 7$

$y[-1, -1] = y[3, 2] = 12$

$y[1:3, 2] = [6, 9]$

index-1,2 along axis-0

index-2 along axis-1