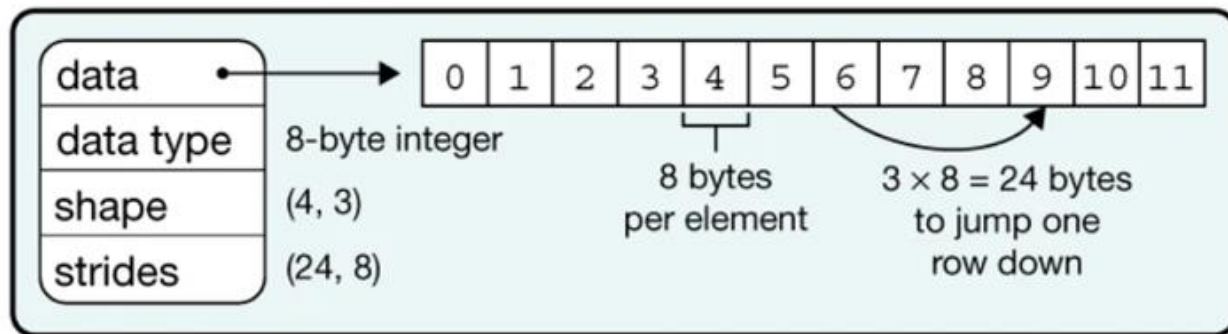


## Структура данных

data =

0	1	2
3	4	5
6	7	8
9	10	11



```
import numpy as np
data = np.arange(12)
data = data.reshape(4,3)
data

array([[ 0,  1,  2],
       [ 3,  4,  5],
       [ 6,  7,  8],
       [ 9, 10, 11]])
```

## Индексация

data[:,1:] →

0	1	2
3	4	5
6	7	8
9	10	11

with **slices**

data[:, ::2] →

0	1	2
3	4	5
6	7	8
9	10	11

with **slices**  
with **steps**

Slices are **start:end:step**,  
any of which can be left blank

```
data[:,1:]

array([[ 1,  2],
       [ 4,  5],
       [ 7,  8],
       [10, 11]])
```

```
data[:, ::2]

array([[ 0,  2],
       [ 3,  5],
       [ 6,  8],
       [ 9, 11]])
```

data[1,2] → 5 with **scalars**

data[data > 9] → 

10	11
----	----

 with **masks**

data [ 

0	1
---	---

, 

1	2
---	---

 ] → [ data[0,1], data[1,2] ] → 

1	5
---	---

 with **arrays**

```
data[1,2]

5
```

```
data[data > 9]

array([10, 11])
```

```
data[[0, 1],[1, 2]]

array([1, 5])
```

## Операции с векторами

0	1		1	1		1	2
3	4		1	1		4	5
6	7		1	1		7	8
9	10		1	1		10	11

▶ `data[:, :2] + 1`

↳ `array([[ 1, 2],  
 [ 4, 5],  
 [ 7, 8],  
 [10, 11]])`

## Агрегация

0	1	2		3
3	4	5	sum axis 1	12
6	7	8		21
9	10	11		30

18	22	26		66
----	----	----	--	----

sum  
axis 0

sum  
axis (0,1)

▶ `np.sum(data, axis = 0)`

↳ `array([18, 22, 26])`

▶ `np.sum(data, axis = 1)`

↳ `array([ 3, 12, 21, 30])`

▶ `np.sum(data)`

↳ `66`

## Операции с массивами разного порядка

0			1	2		0	0
3						3	6
6						6	12
9						9	18

▶ `data2 = data[:, 0]`  
`data2`

↳ `array([0, 3, 6, 9])`

▶ `data[0, 1:]`  
`data1 = data[0, 1:].reshape(2, 1)`  
`data1`

↳ `array([[1],  
 [2]])`

▶ `data2 * data1`

↳ `array([[ 0, 3, 6, 9],  
 [ 0, 6, 12, 18]])`