

```
import numpy as np
```

Zadanie 1

```
a = np.array([1,3,5,2,7])
```

a

```
array([1, 3, 5, 2, 7])
```

```
b = np.array([1,3,5.0,2,7])
```

b

```
array([1., 3., 5., 2., 7.])
```

```
b = np.array([3.14, 4, 2, 3],dtype=int)
```

b

```
array([3, 4, 2, 3])
```

```
c=np.array([[[1,2,3],[4,5,6]],[[1,2,3],[4,5,6]]])
```

c

```
↳ array([[[1, 2, 3],  
          [4, 5, 6]],  
        [[1, 2, 3],  
          [4, 5, 6]]])
```

```
d=np.array([[-3.0,2.3],[0.1,5.0],[8.0,11.0]])
```

d

```
array([[-3. ,  2.3],  
       [ 0.1,  5. ]])
```

```
[ 8. , 11. ]])
```

```
e=np.array([[[2,4],[1,2],[8,9]],[[7,6],[-3,4],[0,8]]])  
e
```

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

Zadanie 2

```
a.ndim,b.ndim,c.ndim,d.ndim,e.ndim
```

```
(1, 1, 3, 2, 3)
```

```
a.shape,b.shape,c.shape,d.shape,e.shape
```

```
((5,), (4,), (2, 2, 3), (3, 2), (2, 3, 2))
```

```
a.size, b.size,c.size,d.size,e.size
```

```
(5, 4, 12, 6, 12)
```

```
a.dtype,b.dtype,c.dtype,d.dtype,e.dtype
```

```
(dtype('int64'),  
 dtype('int64'),  
 dtype('int64'),  
 dtype('float64'),  
 dtype('int64'))
```

```
a.itemsize,b.itemsize,c.itemsize,d.itemsize,e.itemsize
```

```
(8, 8, 8, 8, 8)
```

```
a.nbytes,b.nbytes,c.nbytes,d.nbytes,e.nbytes
```

```
(40, 32, 96, 48, 96)
```

Zadanie 3

```
X1 = np.random.random((4,3))
```

```
X2 = np.zeros((2,1))
```

```
X3 = np.full((6,2,1),2)
```

```
X4 = np.random.randint(0,7,(5,8))
```

```
X5 = np.eye(5)
```

X1

```
array([[0.37851586, 0.88499568, 0.47359443],  
       [0.72929307, 0.06215834, 0.6278605 ],  
       [0.84064081, 0.62559174, 0.83890048],  
       [0.31917853, 0.96891742, 0.39942492]])
```

X2

```
array([[0.],  
       [0.]])
```

X3

```
array([[[2],
        [2]],

       [[2],
        [2]],

       [[2],
        [2]],

       [[2],
        [2]],

       [[2],
        [2]],

       [[2],
        [2]]])
```

X4

```
array([[2, 1, 2, 4, 6, 2, 4, 2],
       [2, 3, 4, 4, 5, 1, 0, 1],
       [2, 2, 2, 1, 0, 1, 5, 0],
       [0, 5, 2, 6, 6, 5, 1, 6],
       [4, 1, 4, 3, 0, 6, 3, 2]])
```

X5

```
array([[1., 0., 0., 0., 0.],
       [0., 1., 0., 0., 0.],
       [0., 0., 1., 0., 0.],
       [0., 0., 0., 1., 0.],
       [0., 0., 0., 0., 1.]])
```

ZADANIE TENSORY

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

```
A.shape
```

```
(3, 2, 1)
```

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

```
A.shape
```

```
(3, 1, 2)
```

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

```
A.shape
```

```
(1, 2, 3)
```

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

```
A.shape
```

```
(2, 1, 3)
```

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

```
A.shape
```

```
(1, 2, 1, 3, 1)
```

Zadanie 4

```
A = np.random.randint(0,6,(4,5))
```

```
A
```

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

```
A[1,4]
```

```
3
```

```
A[1:3,4]
```

```
array([3, 5])
```

```
B = A[1:3,3:5]
```

```
B
```

```
array([[3, 5],  
       [2, 1]])
```

```
B = A[1:3,3:5].copy()
```

```
B
```

```
array([[2, 1],  
       [5, 0]])
```

```
B[0,0]=100
```

```
B
```

```
array([[100,  1],  
       [  5,  0]])
```

```
A
```

```
array([[1, 0, 5, 3, 5],
```

```
[1, 3, 5, 2, 1],  
[3, 5, 2, 5, 0],  
[0, 3, 0, 4, 0]])
```

```
B = A[:,1:3]
```

B

```
array([[0, 5],  
       [3, 5],  
       [5, 2],  
       [3, 0]])
```

```
A[1:3,3:5]
```

```
array([[3, 3],  
       [2, 5]])
```

```
A[1:,3:]
```

```
array([[3, 3],  
       [2, 5],  
       [4, 5]])
```

Zadanie 4

```
A = np.random.randint(0,6,(4,5))
```

A

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

```
B = A[:,1:3]
```

```
B
```

```
array([[0, 5],
       [3, 5],
       [5, 2],
       [3, 0]])
```

```
B1 = A[:,1:3].copy()
```

```
B1
```

```
array([[0, 5],
       [3, 5],
       [5, 2],
       [3, 0]])
```

```
C = A[1:3,1:5]
```

```
C
```

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

```
C1 = A[1:3,1:5].copy()
```

```
C1
```

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

Zadanie 5

```
D = np.array(np.arange(0,12))
```

```
D
```



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

```
D.shape
```

```
(12,)
```

```
print(D.reshape(2,6))
```

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

```
print(D.reshape(3,4))
```

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

```
print(D.reshape(3,4,1))
```

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

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

```
[[ 8]
 [ 9]
 [10]
 [11]]]
```

```
print(D.reshape(3,1,2,1,2))
```

```
[[[[[ 0  1]]
```

```
[[ 2  3]]]
```

```
[[[ 4  5]]
```

```
[[ 6  7]]]
```

```
[[[ 8  9]]
```

```
[[10 11]]]
```

Zadanie 5 (przy 24)

```
D = np.array(np.arange(0,24))
```

```
D
```

```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,  
       17, 18, 19, 20, 21, 22, 23])
```

```
print(D.reshape(4,6))
```

```
[[ 0  1  2  3  4  5]  
 [ 6  7  8  9 10 11]  
 [12 13 14 15 16 17]  
 [18 19 20 21 22 23]]
```

```
print(D.reshape(6,4))
```

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

```
[ 8  9 10 11]
[12 13 14 15]
[16 17 18 19]
[20 21 22 23]]
```

```
print(D.reshape(8,3))
```

```
[[ 0  1  2]
 [ 3  4  5]
 [ 6  7  8]
 [ 9 10 11]
 [12 13 14]
 [15 16 17]
 [18 19 20]
 [21 22 23]]
```

```
print(D.reshape(3,8))
```

```
[[ 0  1  2  3  4  5  6  7]
 [ 8  9 10 11 12 13 14 15]
 [16 17 18 19 20 21 22 23]]
```

```
print(D.reshape(2,12))
```

```
[[ 0  1  2  3  4  5  6  7  8  9 10 11]
 [12 13 14 15 16 17 18 19 20 21 22 23]]
```

```
print(D.reshape(12,2))
```

```
[[ 0  1]
 [ 2  3]
 [ 4  5]
 [ 6  7]
 [ 8  9]
 [10 11]
 [12 13]
 [14 15]]
```

```
[16 17]
[18 19]
[20 21]
[22 23]]
```

```
print(D.reshape(3,8))
```

```
[[ 0  1  2  3  4  5  6  7]
 [ 8  9 10 11 12 13 14 15]
 [16 17 18 19 20 21 22 23]]
```

```
print(D.reshape(8,3))
```

```
[[ 0  1  2]
 [ 3  4  5]
 [ 6  7  8]
 [ 9 10 11]
 [12 13 14]
 [15 16 17]
 [18 19 20]
 [21 22 23]]
```

```
print(D.reshape(2,2,2,3))
```

```
[[[ [ 0  1  2]
      [ 3  4  5]]
```

```
    [[ 6  7  8]
     [ 9 10 11]]]
```

```
[[[12 13 14]
    [15 16 17]]
```

```
    [[18 19 20]
     [21 22 23]]]]
```

```
print(D.reshape(2,2,3,2))
```

```
[[[ [ 0  1]
      [ 2  3]
      [ 4  5]]
```

```
   [[ 6  7]
    [ 8  9]
    [10 11]]]
```

```
[[[12 13]
    [14 15]
    [16 17]]
```

```
   [[18 19]
    [20 21]
    [22 23]]]]
```

```
print(D.reshape(2,3,2,2))
```

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

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

```
   [[ 8  9]
    [10 11]]]
```

```
[[[12 13]
    [14 15]]
```

```
   [[16 17]
    [18 19]]
```

```
   [[20 21]
    [22 23]]]]
```

```
print(D.reshape(3,2,2,2))
```

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

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

```
[[[ 8  9]
    [10 11]]
```

```
    [[12 13]
     [14 15]]]
```

```
[[[16 17]
    [18 19]]
```

```
    [[20 21]
     [22 23]]]
```

```
print(D.reshape(2,4,3))
```

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

```
[[12 13 14]
 [15 16 17]
 [18 19 20]
 [21 22 23]]]
```

```
print(D.reshape(2,3,4))
```

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

```
[ 8  9 10 11]]
```

```
[[12 13 14 15]  
 [16 17 18 19]  
 [20 21 22 23]]]
```

```
print(D.reshape(3,4,2))
```

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

```
[[ 8  9]  
 [10 11]  
 [12 13]  
 [14 15]]
```

```
[[16 17]  
 [18 19]  
 [20 21]  
 [22 23]]]
```

```
print(D.reshape(3,2,4))
```

```
[[[ 0  1  2]  
   [ 3  4  5]]
```

```
[[ 6  7  8]  
 [ 9 10 11]]
```

```
[[12 13 14]  
 [15 16 17]]
```

```
[[18 19 20]  
 [21 22 23]]]
```

```
print(D.reshape(4,2,3))
```

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

```
[[12 13 14]
 [15 16 17]
 [18 19 20]
 [21 22 23]]]
```

```
print(D.reshape(4,3,2))
```

```
[[[ 0  1]
   [ 2  3]
   [ 4  5]]
```

```
[[ 6  7]
 [ 8  9]
 [10 11]]
```

```
[[12 13]
 [14 15]
 [16 17]]
```

```
[[18 19]
 [20 21]
 [22 23]]]
```

```
print(D.reshape(2,6,2))
```

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

```
[[12 13]
```



```
[14 15]
[16 17]
[18 19]
[20 21]
[22 23]]]
```

```
print(D.reshape(2,2,6))
```

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

```
[[12 13 14 15 16 17]
 [18 19 20 21 22 23]]]
```

```
print(D.reshape(6,2,2))
```

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

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

```
[[ 8  9]
 [10 11]]]
```

```
[[12 13]
 [14 15]]]
```

```
[[16 17]
 [18 19]]]
```

```
[[20 21]
 [22 23]]]
```

Zadanie 6

```
c = np.array([[2,4],[1,2]])
```

```
d = np.array([[ -3,5],[-7,8]])
```

```
print("c=\n",c)
print("d=\n",d)
print("c.shape=",c.shape)
print("d.shape=",d.shape)
print(np.concatenate([c,d],axis=0))
print(np.concatenate([c,d],axis=1))
print(np.concatenate([d,c],axis=0))
print(np.concatenate([d,c],axis=1))
```

```
c=
[[2 4]
 [1 2]]
d=
[[-3  5]
 [-7  8]]
c.shape= (2, 2)
d.shape= (2, 2)
[[ 2  4]
 [ 1  2]
 [-3  5]
 [-7  8]]
[[ 2  4 -3  5]
 [ 1  2 -7  8]]
[[-3  5]
 [-7  8]
 [ 2  4]
 [ 1  2]]
[[-3  5  2  4]
 [-7  8  1  2]]
```

zadanie 7

c*d

```
array([[ -6, 20],  
       [-7, 16]])
```

```
d+6  
d
```

```
array([[ -3,  5],  
       [-7,  8]])
```

```
d*8  
d
```

```
array([[ -3,  5],  
       [-7,  8]])
```

```
d-8  
d
```

```
array([[ -3,  5],  
       [-7,  8]])
```

```
d/8  
d
```

```
array([[ -3,  5],  
       [-7,  8]])
```

```
abs(8)  
d
```

```
array([[ -3,  5],  
       [-7,  8]])
```

```
np.exp(d)  
d
```

```
array([[ -3,  5],  
       [-7,  8]])
```

```
np.power(d,4)  
d
```

```
array([[ -3,  5],  
       [-7,  8]])
```

```
A = np.array([[1],[1]])  
A
```

```
array([[1],  
       [1]])
```

```
A = A+X2  
A
```

```
array([[1.],  
       [1.]])
```

```
A = A-X2  
A
```

```
array([[1.],  
       [1.]])
```

```
A = A*X2
```

```
A
```

```
array([[0.],  
       [0.]])
```

Zadanie 8

```
c = np.array([[1,1,1],[1,1,1]])
```

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

```
c+d
```

```
array([[1, 2, 3],  
       [1, 2, 3]])
```

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

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

```
c+d
```

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

