PRACTICAL NO 3

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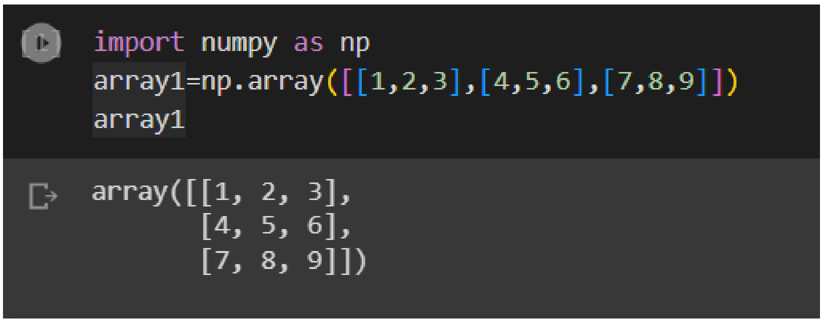
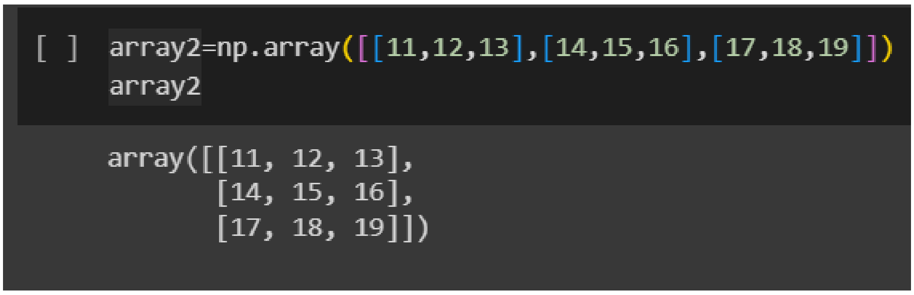
Div :- G(4)

Perform all the Numpy operations in Python.



```
import numpy as np
array1=np.array([[1,2,3],[4,5,6],[7,8,9]])
array1
```

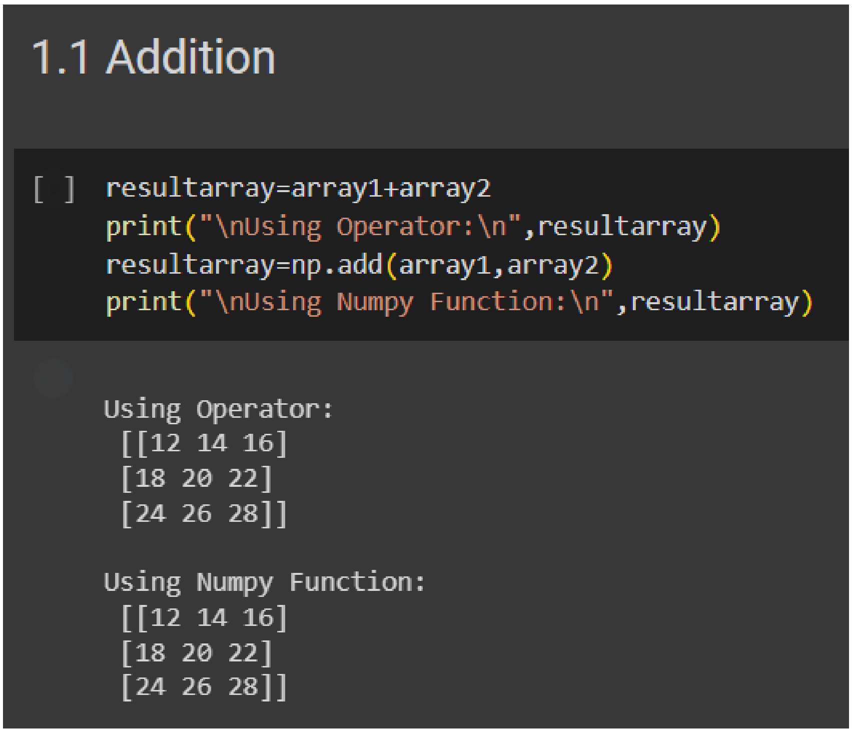
```
array([[1, 2, 3],
       [4, 5, 6],
       [7, 8, 9]])
```



```
array2=np.array([[11,12,13],[14,15,16],[17,18,19]])
array2
```

```
array([[11, 12, 13],
       [14, 15, 16],
       [17, 18, 19]])
```

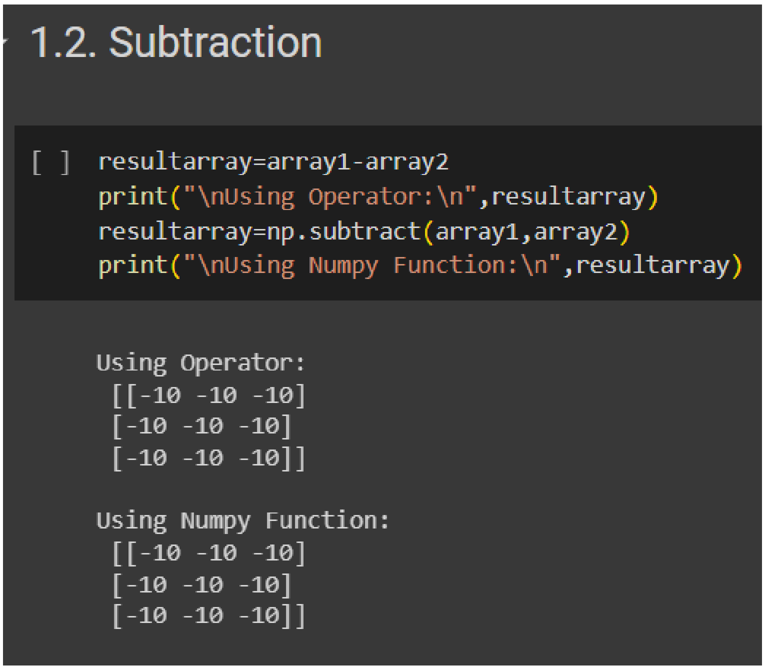
1. Perform all matrix operations



1.1 Addition

```
resultarray=array1+array2
print("\nUsing Operator:\n",resultarray)
resultarray=np.add(array1,array2)
print("\nUsing Numpy Function:\n",resultarray)
```

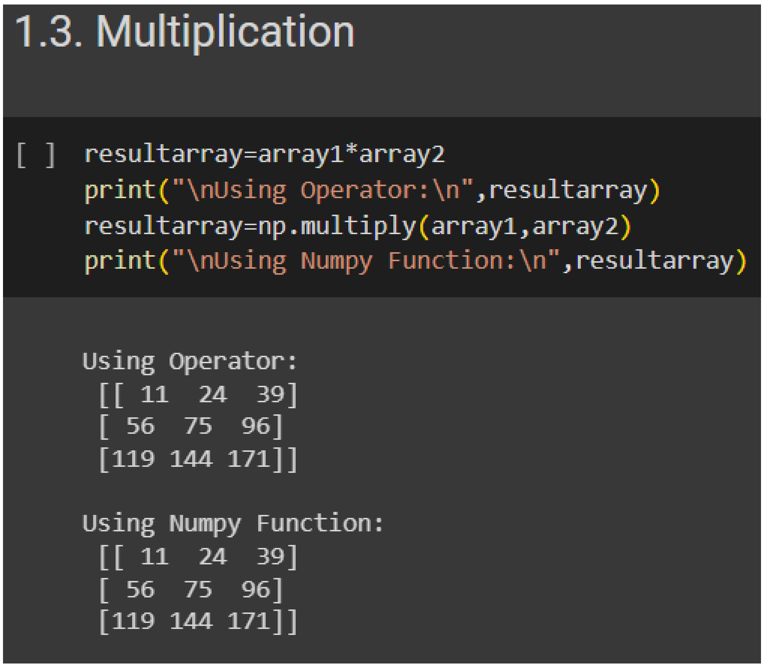
```

Using Operator:
 [[12 14 16]
 [18 20 22]
 [24 26 28]]

Using Numpy Function:
 [[12 14 16]
 [18 20 22]
 [24 26 28]]
```



1.2. Subtraction

```
resultarray=array1-array2
print("\nUsing Operator:\n",resultarray)
resultarray=np.subtract(array1,array2)
print("\nUsing Numpy Function:\n",resultarray)
```

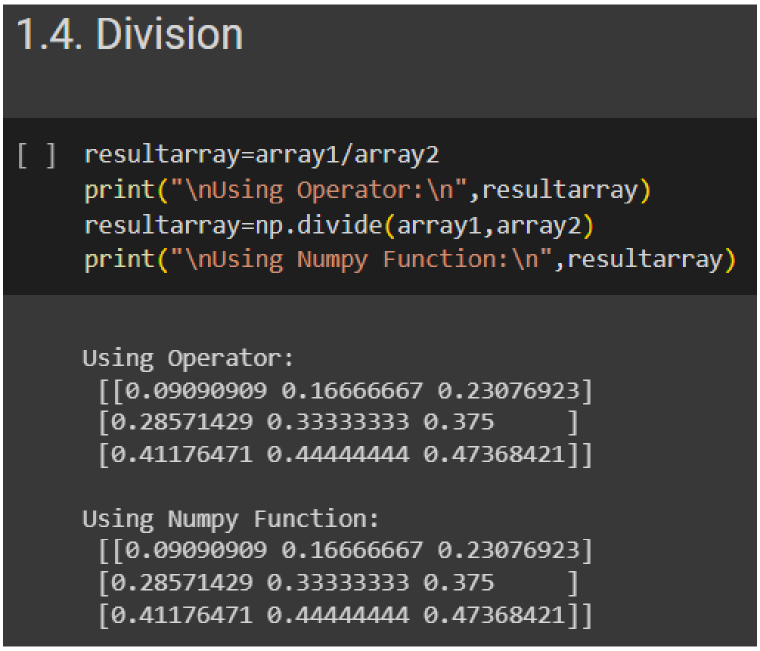
```
Using Operator:
 [[-10 -10 -10]
 [-10 -10 -10]
 [-10 -10 -10]]

Using Numpy Function:
 [[-10 -10 -10]
 [-10 -10 -10]
 [-10 -10 -10]]
```



1.3. Multiplication

```
resultarray=array1*array2
print("\nUsing Operator:\n",resultarray)
resultarray=np.multiply(array1,array2)
print("\nUsing Numpy Function:\n",resultarray)
```

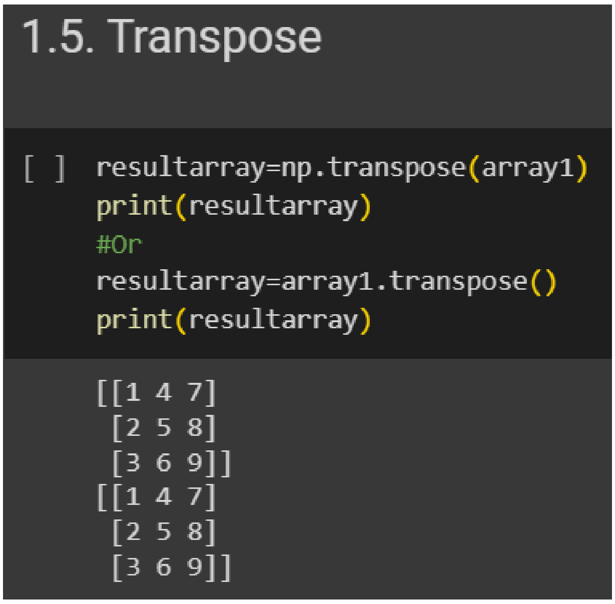
```
Using Operator:
 [[ 11  24  39]
 [ 56  75  96]
 [119 144 171]]

Using Numpy Function:
 [[ 11  24  39]
 [ 56  75  96]
 [119 144 171]]
```



1.4. Division

```
resultarray=array1/array2
print("\nUsing Operator:\n",resultarray)
resultarray=np.divide(array1,array2)
print("\nUsing Numpy Function:\n",resultarray)
```

```
Using Operator:
 [[0.09090909 0.16666667 0.23076923]
 [0.28571429 0.33333333 0.375     ]
 [0.41176471 0.44444444 0.47368421]]

Using Numpy Function:
 [[0.09090909 0.16666667 0.23076923]
 [0.28571429 0.33333333 0.375     ]
 [0.41176471 0.44444444 0.47368421]]
```

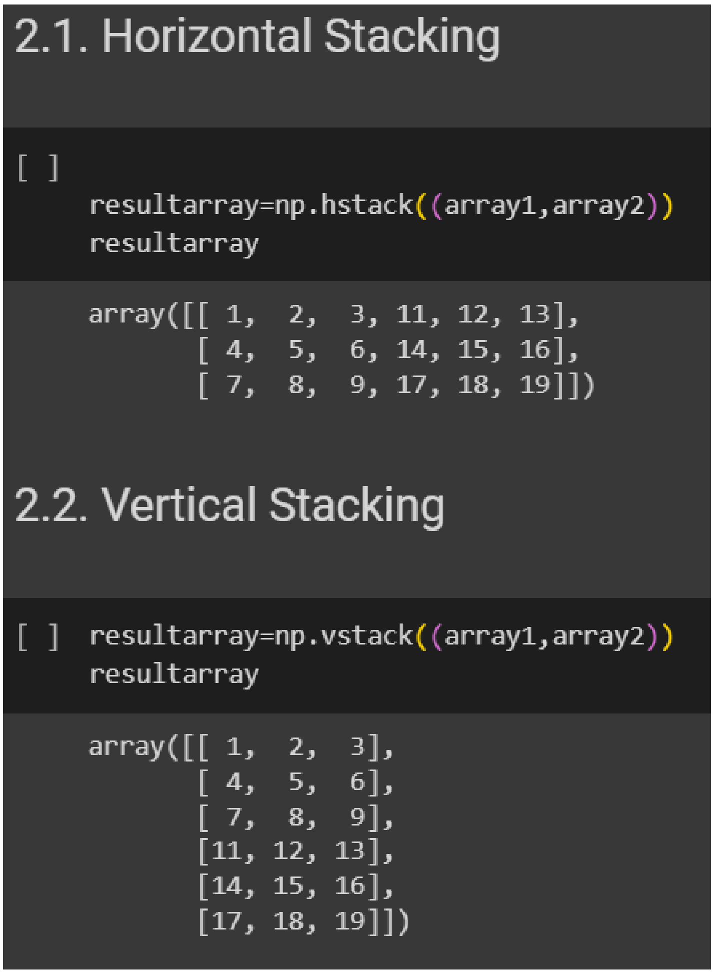


1.5. Transpose

```
[ ]  resultarray=np.transpose(array1)
     print(resultarray)
     #Or
     resultarray=array1.transpose()
     print(resultarray)
```

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

2. Horizontal and vertical stacking of Numpy Arrays



2.1. Horizontal Stacking

```
[ ]
     resultarray=np.hstack((array1,array2))
     resultarray
```

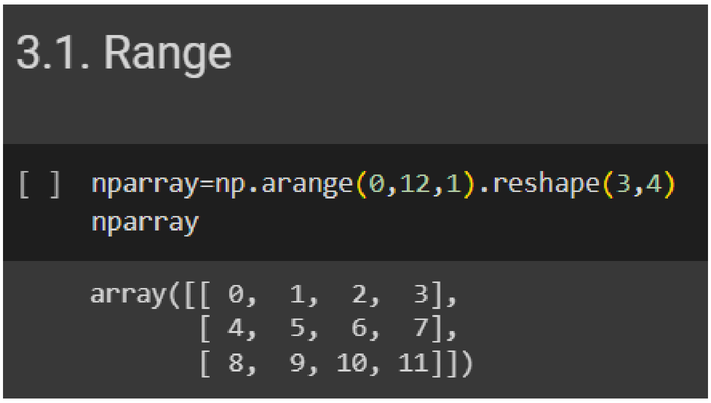
```
array([[ 1,  2,  3, 11, 12, 13],
       [ 4,  5,  6, 14, 15, 16],
       [ 7,  8,  9, 17, 18, 19]])
```

2.2. Vertical Stacking

```
[ ]  resultarray=np.vstack((array1,array2))
     resultarray
```

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

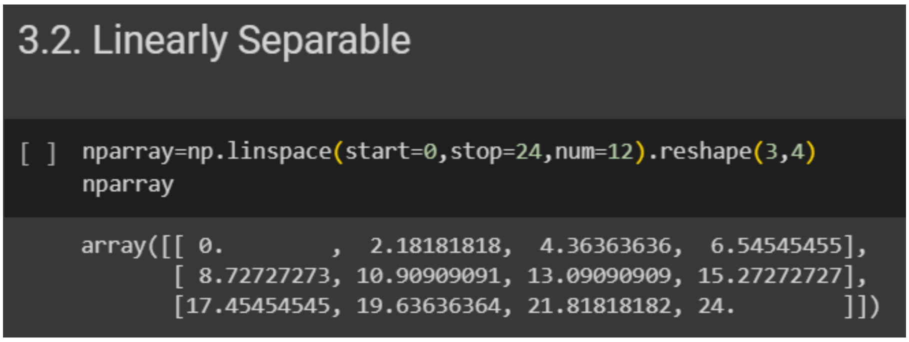
3. Custom sequence generation



3.1. Range

```
[ ]  nparray=np.arange(0,12,1).reshape(3,4)
     nparray
```

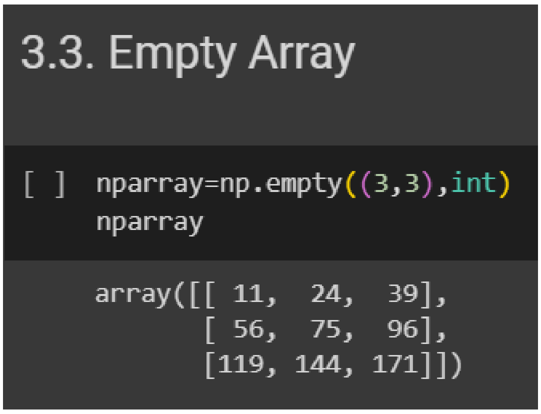
```
     array([[ 0,  1,  2,  3],
            [ 4,  5,  6,  7],
            [ 8,  9, 10, 11]])
```



3.2. Linearly Separable

```
[ ]  nparray=np.linspace(start=0,stop=24,num=12).reshape(3,4)
     nparray
```

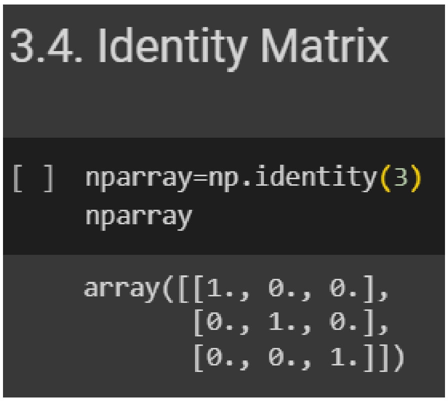
```
     array([[ 0.        ,  2.18181818,  4.36363636,  6.54545455],
            [ 8.72727273, 10.90909091, 13.09090909, 15.27272727],
            [17.45454545, 19.63636364, 21.81818182, 24.        ]])
```



3.3. Empty Array

```
[ ]  nparray=np.empty((3,3),int)
     nparray
```

```
     array([[ 11,  24,  39],
            [ 56,  75,  96],
            [119, 144, 171]])
```

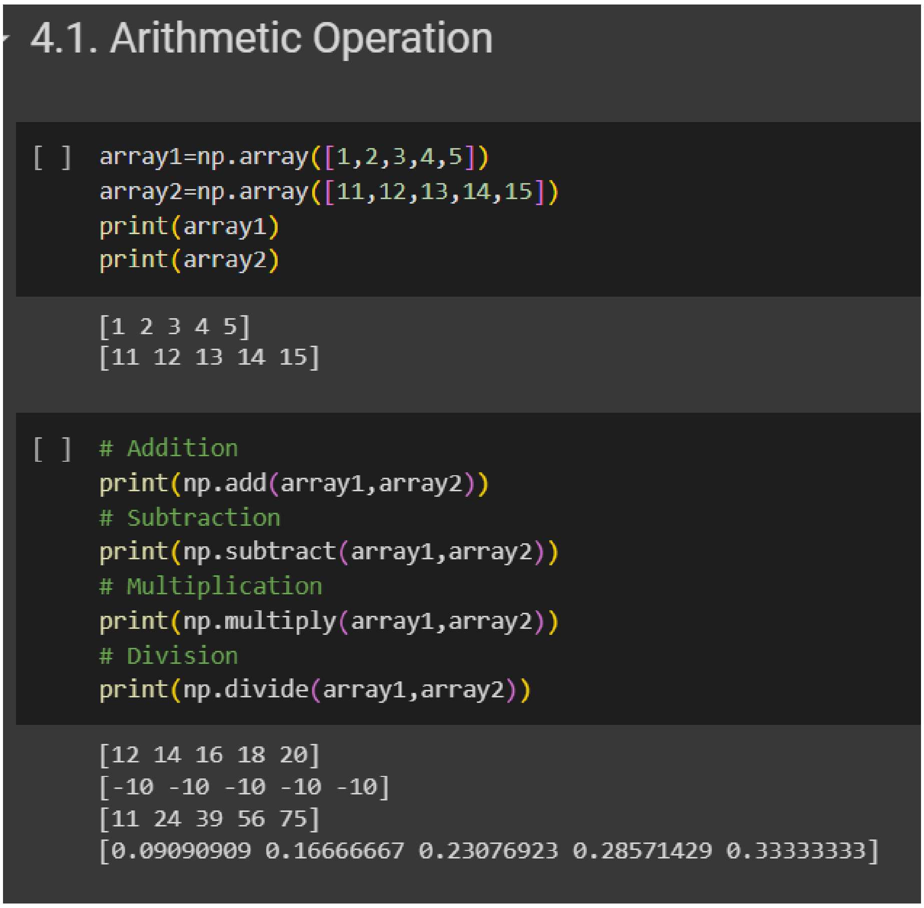


3.4. Identity Matrix

```
[ ]  nparray=np.identity(3)
     nparray
```

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

4. Arithmetic and Statistical Operations, Mathematical Operations, Bitwise Operators



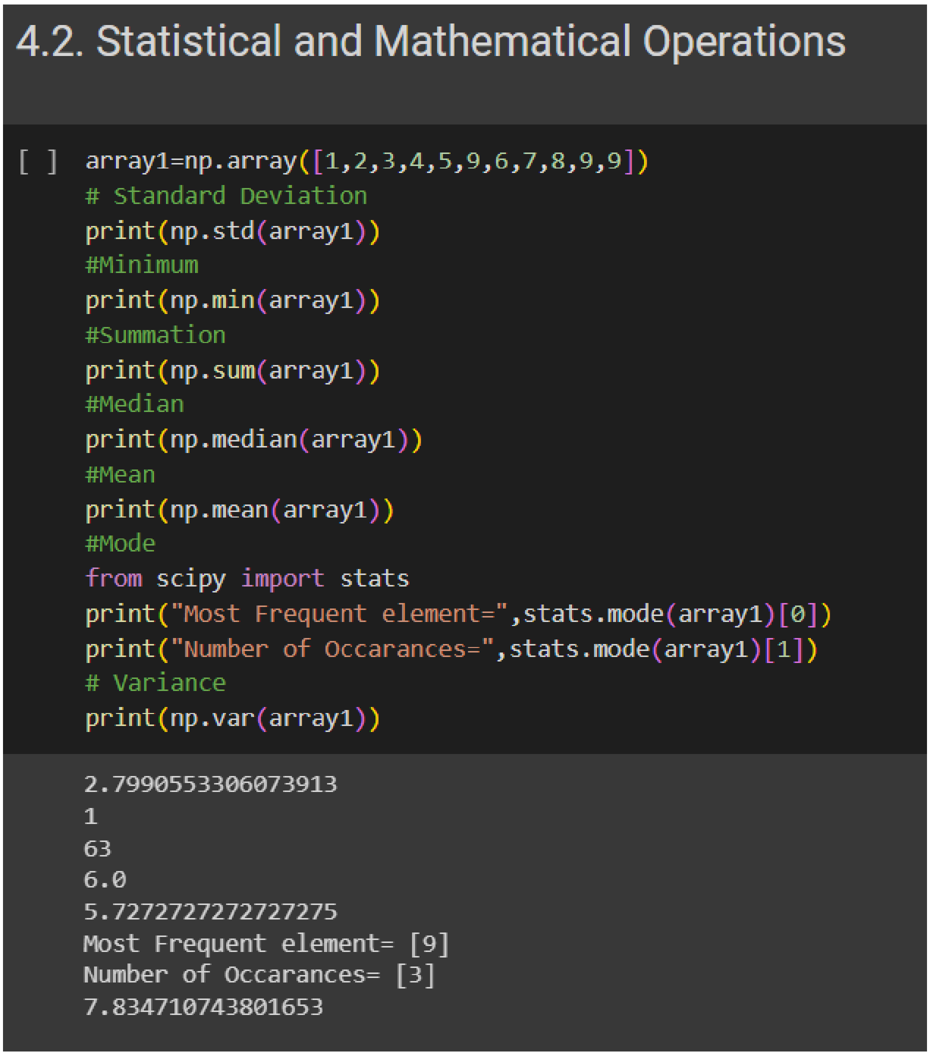
4.1. Arithmetic Operation

```
array1=np.array([1,2,3,4,5])
array2=np.array([11,12,13,14,15])
print(array1)
print(array2)
```

```
[1 2 3 4 5]
[11 12 13 14 15]
```

```
# Addition
print(np.add(array1,array2))
# Subtraction
print(np.subtract(array1,array2))
# Multiplication
print(np.multiply(array1,array2))
# Division
print(np.divide(array1,array2))
```

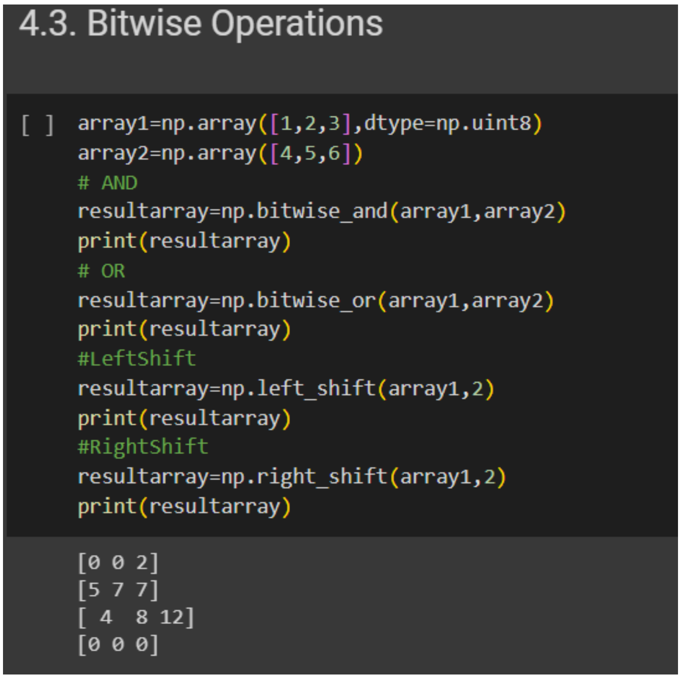
```
[12 14 16 18 20]
[-10 -10 -10 -10 -10]
[11 24 39 56 75]
[0.09090909 0.16666667 0.23076923 0.28571429 0.33333333]
```



4.2. Statistical and Mathematical Operations

```
array1=np.array([1,2,3,4,5,9,6,7,8,9,9])
# Standard Deviation
print(np.std(array1))
#Minimum
print(np.min(array1))
#Summation
print(np.sum(array1))
#Median
print(np.median(array1))
#Mean
print(np.mean(array1))
#Mode
from scipy import stats
print("Most Frequent element=",stats.mode(array1)[0])
print("Number of Occarances=",stats.mode(array1)[1])
# Variance
print(np.var(array1))
```

```
2.7990553306073913
1
63
6.0
5.7272727272727275
Most Frequent element= [9]
Number of Occarances= [3]
7.834710743801653
```

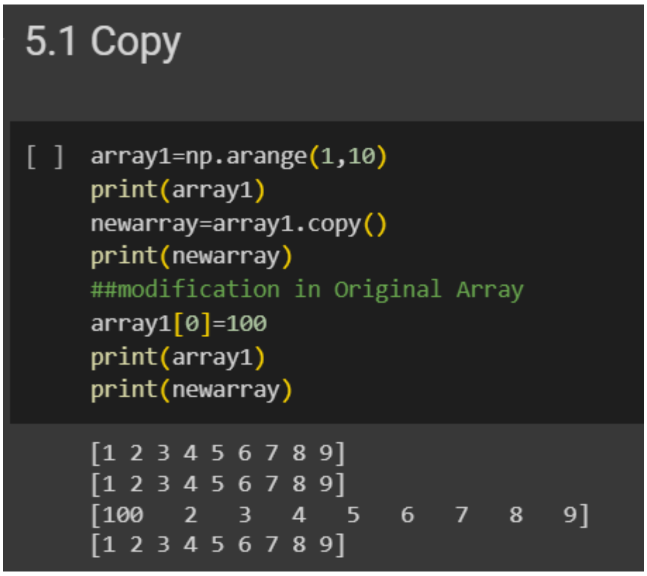


4.3. Bitwise Operations

```
[ ]  array1=np.array([1,2,3],dtype=np.uint8)
     array2=np.array([4,5,6])
     # AND
     resultarray=np.bitwise_and(array1,array2)
     print(resultarray)
     # OR
     resultarray=np.bitwise_or(array1,array2)
     print(resultarray)
     #LeftShift
     resultarray=np.left_shift(array1,2)
     print(resultarray)
     #RightShift
     resultarray=np.right_shift(array1,2)
     print(resultarray)
```

```
[0 0 2]
[5 7 7]
[ 4  8 12]
[0 0 0]
```

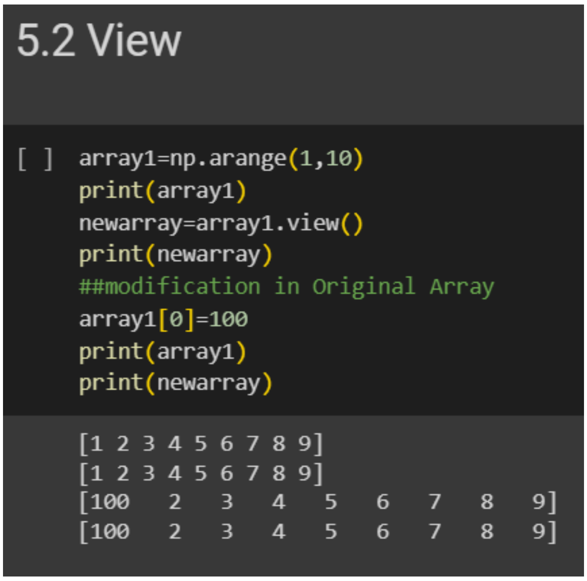
5. Copying and viewing arrays



5.1 Copy

```
[ ]  array1=np.arange(1,10)
     print(array1)
     newarray=array1.copy()
     print(newarray)
     ##modification in Original Array
     array1[0]=100
     print(array1)
     print(newarray)
```

```
[1 2 3 4 5 6 7 8 9]
[1 2 3 4 5 6 7 8 9]
[100   2   3   4   5   6   7   8   9]
[1 2 3 4 5 6 7 8 9]
```

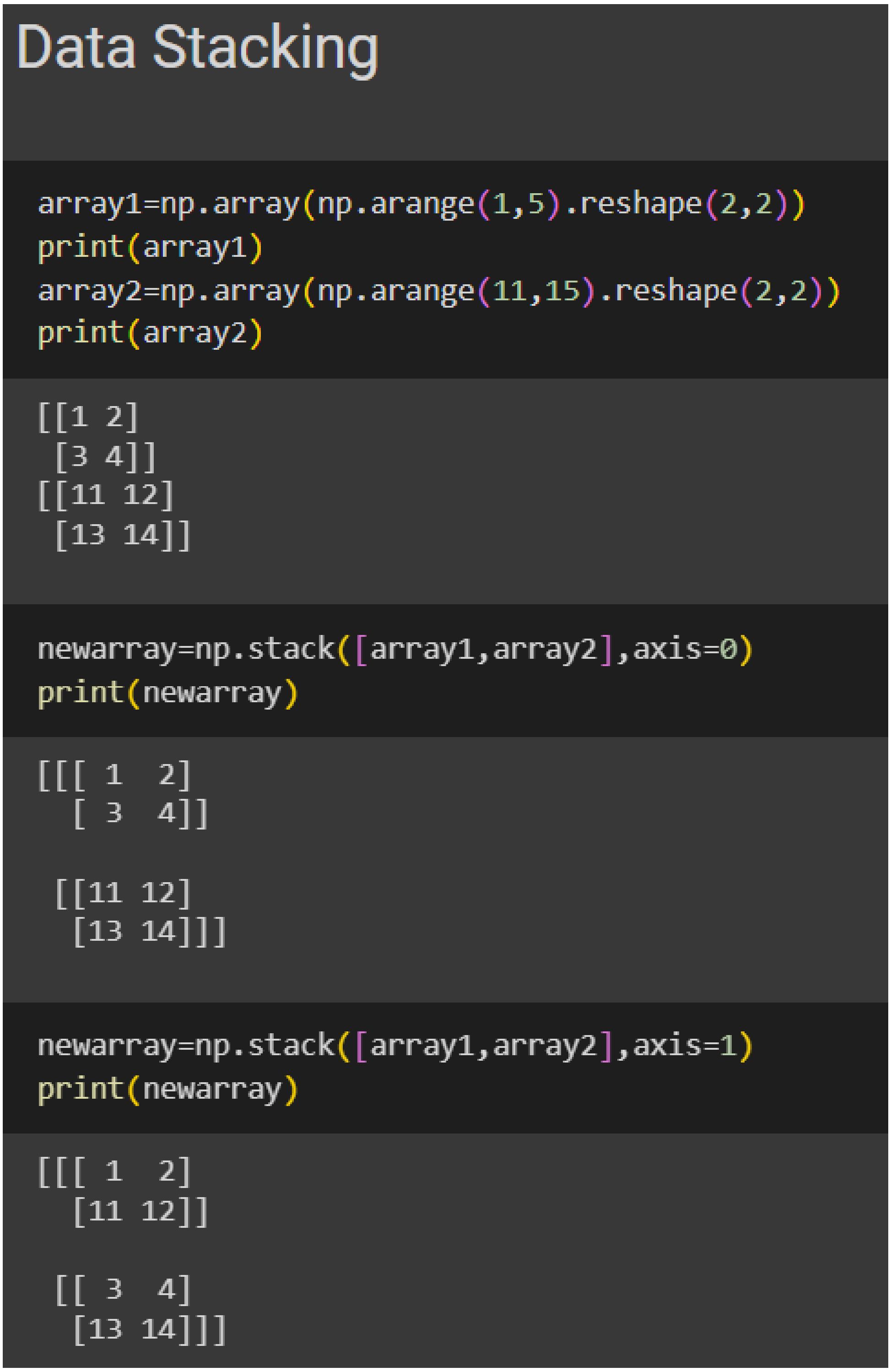


5.2 View

```
[ ]  array1=np.arange(1,10)
     print(array1)
     newarray=array1.view()
     print(newarray)
     ##modification in Original Array
     array1[0]=100
     print(array1)
     print(newarray)
```

```
[1 2 3 4 5 6 7 8 9]
[1 2 3 4 5 6 7 8 9]
[100   2   3   4   5   6   7   8   9]
[100   2   3   4   5   6   7   8   9]
```

6. Data Stacking, Searching, Sorting, Counting, Broadcasting



Data Stacking

```
array1=np.array(np.arange(1,5).reshape(2,2))
print(array1)
array2=np.array(np.arange(11,15).reshape(2,2))
print(array2)
```

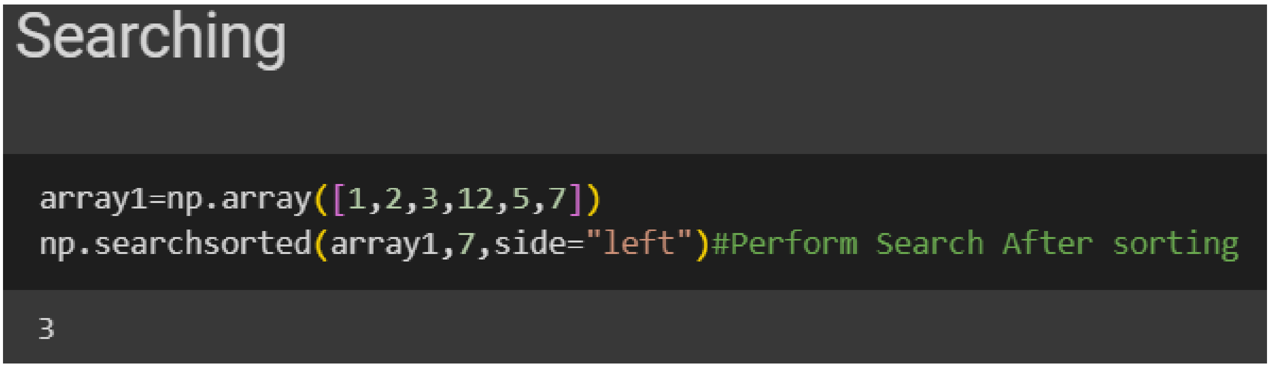
```
[[1 2]
 [3 4]]
[[11 12]
 [13 14]]
```

```
newarray=np.stack([array1,array2],axis=0)
print(newarray)
```

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

 [[11 12]
  [13 14]]]
```

```
newarray=np.stack([array1,array2],axis=1)
print(newarray)
```

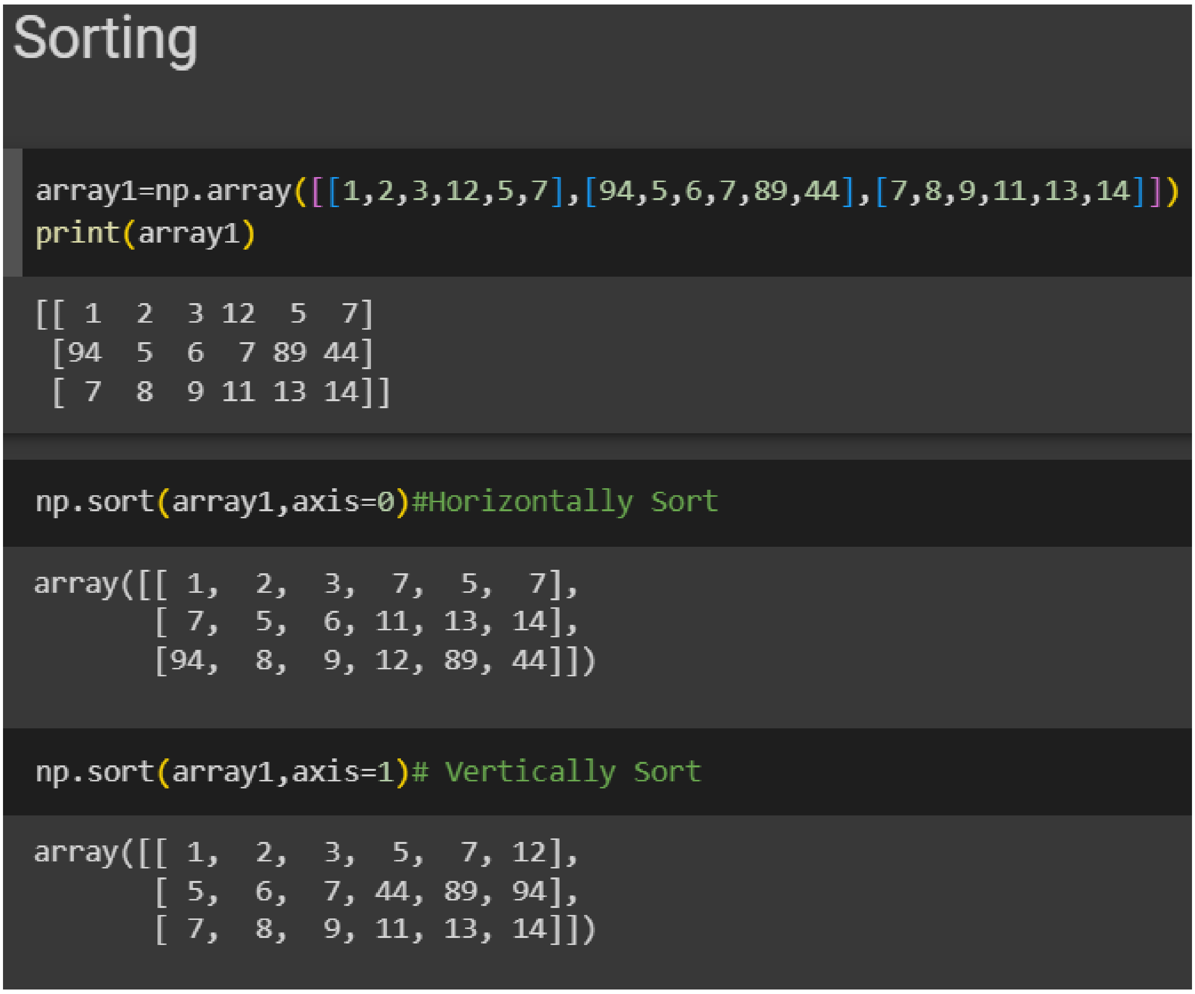
```
[[[ 1  2]
  [11 12]]

 [[ 3  4]
  [13 14]]]
```



Searching

```
array1=np.array([1,2,3,12,5,7])
np.searchsorted(array1,7,side="left")#Perform Search After sorting
```

```
3
```



Sorting

```
array1=np.array([[1,2,3,12,5,7],[94,5,6,7,89,44],[7,8,9,11,13,14]])
print(array1)
```

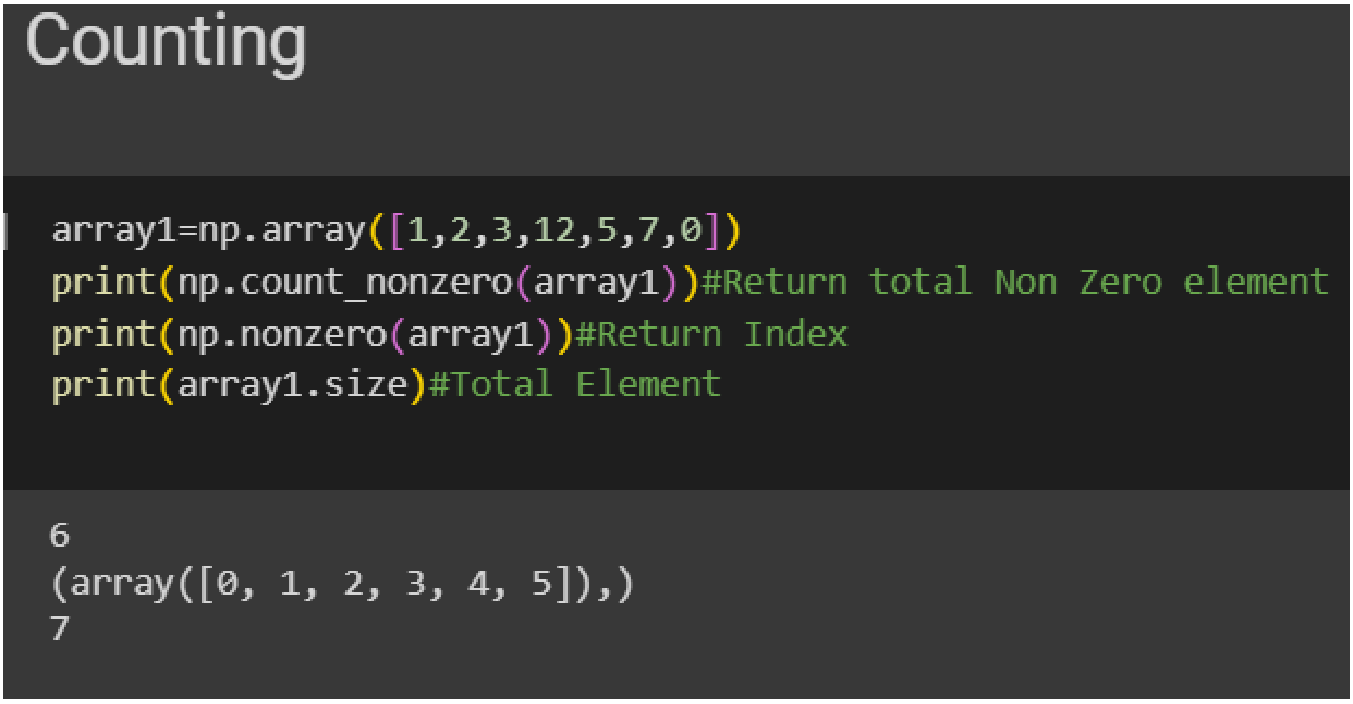
```
[[ 1  2  3 12  5  7]
 [94  5  6  7 89 44]
 [ 7  8  9 11 13 14]]
```

```
np.sort(array1,axis=0)#Horizontally Sort
```

```
array([[ 1,  2,  3,  7,  5,  7],
       [ 7,  5,  6, 11, 13, 14],
       [94,  8,  9, 12, 89, 44]])
```

```
np.sort(array1,axis=1)# Vertically Sort
```

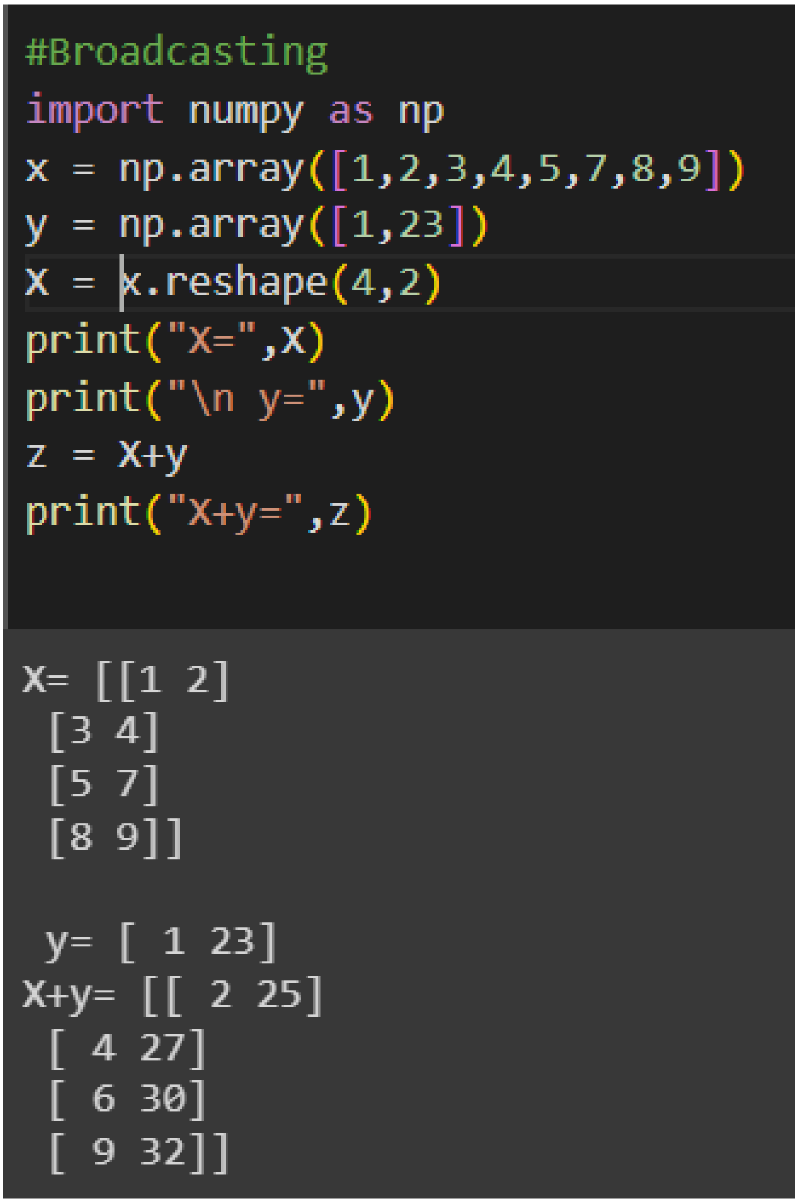
```
array([[ 1,  2,  3,  5,  7, 12],
       [ 5,  6,  7, 44, 89, 94],
       [ 7,  8,  9, 11, 13, 14]])
```



Counting

```
array1=np.array([1,2,3,12,5,7,0])
print(np.count_nonzero(array1))#Return total Non Zero element
print(np.nonzero(array1))#Return Index
print(array1.size)#Total Element
```

```
6
(array([0, 1, 2, 3, 4, 5]),)
7
```



```
#Broadcasting
import numpy as np
x = np.array([1,2,3,4,5,7,8,9])
y = np.array([1,23])
X = x.reshape(4,2)
print("X=",X)
print("\n y=",y)
z = X+y
print("X+y=",z)
```

```
X= [[1 2]
 [3 4]
 [5 7]
 [8 9]]

 y= [ 1 23]
X+y= [[ 2 25]
 [ 4 27]
 [ 6 30]
 [ 9 32]]
```