```python
In [1]:  # 1.Write a NumPy program to broadcast on different shapes of arrays where p(3,3) + q(3).
         import numpy as np
         p=np.array([[6,7,8],
                     [1, 2, 3],
                     [4, 5, 6]])
         q=np.array([10, 11, 12])
         print("Original arrays:")
         print("p : ",p)
         print("q :",q)
         arr=p+q
         print("Result :",arr)

         Original arrays:
         p :  [[6 7 8]
          [1 2 3]
          [4 5 6]]
         q : [10 11 12]
         Result : [[16 18 20]
          [11 13 15]
          [14 16 18]]
```

```python
In [24]: # 2.How to get the second largest value of an array when grouped by another array?
         a=np.arange(1,11)
         print("Array:",a)
         n=1
         print (a[np.argsort(a)[-n:]])

         Array: [ 1  2  3  4  5  6  7  8  9 10]
         [10]
```

```python
In [23]: # 3. How to find the position of missing values in numpy array?
         a=np.array([45,7,np.nan,23,34,45,np.nan])
         np.argwhere(np.isnan(a))

Out[23]: array([[2],
               [6]], dtype=int64)
```

```python
In [5]:  # 4.How to replace all missing values with 0 in a numpy array?
         a=np.array([45,7,np.nan,23,34,45,np.nan])
         a=np.where(np.isnan(a),0,a)
         print(a)

         [45.  7.  0. 23. 34. 45.  0.]
```

```python
In [9]:  # 5.Write a NumPy program to create a 3x3x3 array with random values.
         a=np.random.random((3,3,3))
         print(a)

         [[[0.08821819 0.13801217 0.81943375]
           [0.53463645 0.64325708 0.08970252]
           [0.13324933 0.34410145 0.28436173]]

          [[0.78156657 0.89363111 0.59223435]
           [0.47125309 0.08662774 0.80424678]
           [0.06559609 0.27280665 0.42514805]]

          [[0.90236498 0.45136106 0.85117748]
           [0.10150944 0.69675327 0.5183887 ]
           [0.19534629 0.51116795 0.97852265]]]
```

```python
In [15]: # 6.Write a NumPy program to create random vector of size 15 and replace the maximum value by -1.
         a=np.random.random(15)
         print("Original array:",a)
         a[a.argmax()] = -1
         print("Maximum value replaced by -1:",a)

         Original array: [0.02318877 0.22627487 0.62002357 0.28286492 0.90122561 0.42803047
          0.11154287 0.05405777 0.18437465 0.80345861 0.5646199  0.65296627
          0.57210543 0.81045259 0.37941052]
         Maximum value replaced by -1: [ 0.02318877  0.22627487  0.62002357  0.28286492 -1.          0.42803047
           0.11154287  0.05405777  0.18437465  0.80345861  0.5646199   0.65296627
           0.57210543  0.81045259  0.37941052]
```

```python
In [3]:  # 7.Write a NumPy program to get the unique elements of an array.
         a=np.array([34,55,34,76,55,65,55])
         print("array:",a)
         print("Unique elements of the array:",np.unique(a))

         array: [34 55 34 76 55 65 55]
         Unique elements of the array: [34 55 65 76]
```

```python
In [14]: # 8.Write a NumPy program to get the values and indices of the elements that are bigger than 10 in a given array.
         import numpy as np
         a=np.array([[23,11,9], [5,7,6]])
         print("array: ",a)
         print("Values bigger than 10 =", a[a>10])
         print("Indices of the elements ", np.nonzero(a > 10))

         array:  [[23 11  9]
          [ 5  7  6]]
         Values bigger than 10 = [23 11]
         Indices of the elements  (array([0, 0], dtype=int64), array([0, 1], dtype=int64))
```

```python
In [6]:  # 9.Write a NumPy program to get the powers of an array values element-wise.
         a=np.arange(7)
         print("array :",a)
         print("The power of array value element-wise:",np.power(a, 3))

         array : [0 1 2 3 4 5 6]
         The power of array value element-wise: [  0   1   8  27  64 125 216]
```

```python
In [9]:  # 10.Write a NumPy program to remove the negative values in a NumPy array with 0.
         a=np.array([-1, -4, 0, 2, 3, 4, 5, -6])
         print("array:",a)
         a[a < 0] = 0
         print("Remove the negative value in numpy array with 0:",a)

         array: [-1 -4  0  2  3  4  5 -6]
         Remove the negative value in numpy array with 0: [0 0 0 2 3 4 5 0]
```

```python
In [11]: # 11.Write a NumPy program to calculate the absolute value element-wise.
         a=np.array([-10.2, 122.2, .20, 4.56, -9.5])
         print("array:",a)
         print("Absolute value element-wise :",np.absolute(a))

         array: [-10.2  122.2    0.2    4.56  -9.5 ]
         Absolute value element-wise : [ 10.2  122.2    0.2    4.56   9.5 ]
```

```python
In [2]:  # 12. Write a NumPy program to replace odd number in 2d array by its square .
         arr1=np.array([[2,4,9,5], [5,7,6,7]])
         print("Array :",arr1)
         print("Replace odd number in 2d array by its square :",np.where(arr1%2==0,arr1,arr1**2))

         Array : [[2 4 9 5]
          [5 7 6 7]]
         Replace odd number in 2d array by its square : [[ 2  4 81 25]
          [25 49  6 49]]
```

```python
In [ ]:
```