1. Introduction to Numpy

Program 1: Import Numpy and implement array.

```
import numpy as np
np= np.array([1, 2, 3])
a = npp.array([[1 , 2, 3, 4], [5, 6, 7, 8], [9, 10, 11, 12]])
print(a)
print(np)
```

```
[[ 1  2  3  4]
 [ 5  6  7  8]
 [ 9 10 11 12]]
[1 2 3]
```

Program 2: Create an array with only zeros and ones.

```
import numpy as np
a=np.zeros(2)
ab=np.ones(4)
print(a)
print(ab)
```

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

Program 3: Program to show function of delete and sort function.

```
a = np.array([1, 2, 3, 4, 5, 6, 7, 8])
print(a)


a=np.delete(a, 1)
print(a)
a = np.array([19, 22, 34, 14, 55, 76, 47, 8])
print(a)


a=np.sort(a)
print(a)
```

```
[1 2 3 4 5 6 7 8]
[1 3 4 5 6 7 8]
[19 22 34 14 55 76 47  8]
[ 8 14 19 22 34 47 55 76]
```

Program 4: Program to show the dimension of a 2d array.

```
import numpy as np

arr = np.array([[1, 2, 3], [4, 5, 6]])
a=arr.ndim
print(arr)
print("dimensions = ", a)
```

```
[[1 2 3]
 [4 5 6]]
dimensions =  2
```

Program 5: Program to show the working of size function.

```
import numpy as np

arr = np.array([[[1, 2, 3], [4, 5, 6]], [[11, 22, 33], [44, 55, 66]]])
a=arr.ndim
b=arr.size
print(arr)
print("dimensions = ", a)
print("size = ", b)
```

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

 [[11 22 33]
  [44 55 66]]]
dimensions =  3
size =  12
```

Program 6: Shape and Reshape function.

```
import numpy as np

arr = np.array([[4,3,2,1], [5, 6, 7, 8]])

print(arr.shape)
```

```
(2, 4)
```

```
a = np.arange(6)
print(a)

b = a.reshape(3,2)
print(b)
```

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

2. Numpy Arithmetic operations.

Program 1: Perform arithmetic operations using Numpy on array.

```
import numpy as np

a=np.array(9)

print("Print A= ",a)

b=np.array([100,200,300])

print("Print B= ", b)

addition= np.add(a,b)

print("After Addition =", addition)

sub=np.subtract(b,a)

print("After Subtraction =",sub)

mul=np.multiply (a,b)

print("After Multiplcation =",mul)

div=np.divide (b,a)

print("After Division =",div)

div1=np.divide (b,5)

print("After Division =",div1)
```

Output:

```
Print A=  9
Print B=  [100 200 300]
After Addition = [109 209 309]
After Subtraction = [ 91 191 291]
After Multiplcation = [ 900 1800 2700]
After Division = [11.11111111 22.22222222 33.33333333]
After Division = [20. 40. 60.]
```

Program 2: Find the reciprocal of the array elements.

```
#reciprocal

a= np.array([0.20,0.25,0.33,0.16])

print(a)

rec=np.reciprocal(a)
print(rec)
```

```
[0.2  0.25 0.33 0.16]
[5.         4.         3.03030303 6.25      ]
```

Program 3: Find the remainder values of the array elements when divided by other array elements.

```
a= np.array ([49,216,30])
b= np.array ([7,8,9])

print("values of A=", a)
print("values of B=", b)

mm=np.mod(a,b)

rm=np.remainder(a,b)

print("values of MOD=", mm)
print("values of REMAINDER=", rm)
```

```
values of A= [ 49 216  30]
values of B= [7 8 9]
values of MOD= [0 0 3]
values of REMAINDER= [0 0 3]
```

Program 4: Find real, imaginary and conjugate values.

```
a=np.array([-5.6j, 0.2j,11, 1+1j])
print(a)

print("real=",np.real(a))

print("imaginary=",np.imag(a))

print("Conjugate=", np.conj(a))
```

```
[-0.-5.6j  0.+0.2j 11.+0.j   1.+1.j ]
real= [-0.  0. 11.  1.]
imaginary= [-5.6  0.2  0.   1. ]
Conjugate= [-0.+5.6j  0.-0.2j 11.-0.j   1.-1.j ]
```

Program 5: Rounding up the array elements.

```
a=np.array ([1.0,5.3,123,0.56,25.5,32])

print(a)

print("after rounding up=", np.around(a))

print("after rounding up to 1st decimal value =", np.around(a,decimals=1))
```

```
[  1.     5.3  123.     0.56  25.5   32.  ]
after rounding up= [  1.   5. 123.   1.  26.  32.]
after rounding up to 1st decimal value = [  1.    5.3 123.    0.6  25.5  32. ]
```

Program 6: floor and ceil function.

```
a=np.array ([4.9,-8.4,321,-0.65,52.5,96])

print(a)

print('\n')

print(np.floor(a))

print(np.ceil(a))
```

```
[  4.9   -8.4  321.    -0.65  52.5   96.  ]


[  4.  -9. 321.  -1.  52.  96.]
[  5.  -8. 321.  -0.  53.  96.]
```

Thank You.