GitHub: https://github.com/sandy100061/MachineLearningAssignment/tree/main/Assignment3

Video Link: https://drive.google.com/file/d/1kpIv8ZiYS__ULIsWdleegplN6IFtRtJz/view?usp=drive_link

Question a

a. Using NumPy, create a random vector of size 15 with only Integers in the range 1-20.

1. Reshape the array to 3 by 5
2. Print array shape.
3. Replace the max in each row by 0.

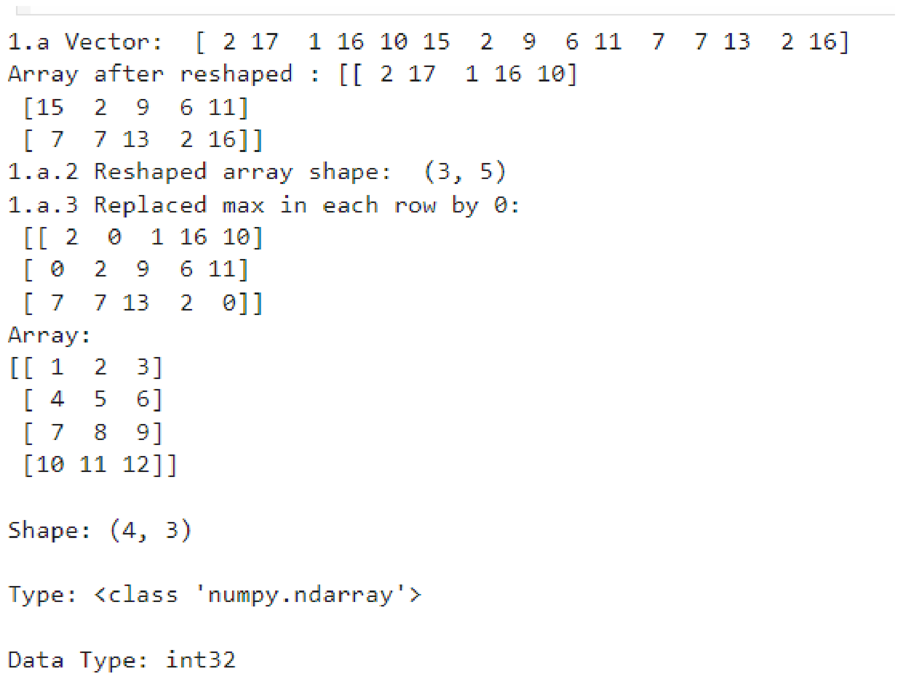
Create a 2-dimensional array of size 4 x 3 (composed of 4-byte integer elements), also print the shape, type and data type

of the array.

Code :-

```
import numpy as npy;

# 1.a
vector = npy.random.randint(1, 20, 15)
print ("1.a Vector: ", vector)
# 1.a.1 Reshape the array to 3 by 5
reshaped = vector.reshape(3, 5)
print("Array after reshaped :", reshaped)
print ("1.a.2 Reshaped array shape: ", reshaped.shape)

# 1.a.3 Replace the max in each row by 0.
for i in range(reshaped.shape[0]):
    reshaped[i, npy.where(reshaped[i] == reshaped[i].max())] = 0
print ("1.a.3 Replaced max in each row by 0: \n", reshaped)

# Create a 2-dimensional array of size 4x3 with 4-byte integer elements
array = npy.array([[1, 2, 3],
                   [4, 5, 6],
                   [7, 8, 9],
                   [10, 11, 12]], dtype=npy.int32)

# Print the array
print("Array:")
print(array)

# Print the shape of the array
print("\nShape:", array.shape)

# Print the type of the array
print("\nType:", type(array))

# Print the data type of the array
print("\nData Type:", array.dtype)
```

Output :-



```
1.a Vector:  [ 2 17  1 16 10 15  2  9  6 11  7  7 13  2 16]
Array after reshaped : [[ 2 17  1 16 10]
 [15  2  9  6 11]
 [ 7  7 13  2 16]]
1.a.2 Reshaped array shape:  (3, 5)
1.a.3 Replaced max in each row by 0:
 [[ 2  0  1 16 10]
 [ 0  2  9  6 11]
 [ 7  7 13  2  0]]
Array:
[[ 1  2  3]
 [ 4  5  6]
 [ 7  8  9]
 [10 11 12]]

Shape: (4, 3)

Type: <class 'numpy.ndarray'>

Data Type: int32
```

Question b

b. Write a program to compute the eigenvalues and right eigenvectors of a given square array given below:

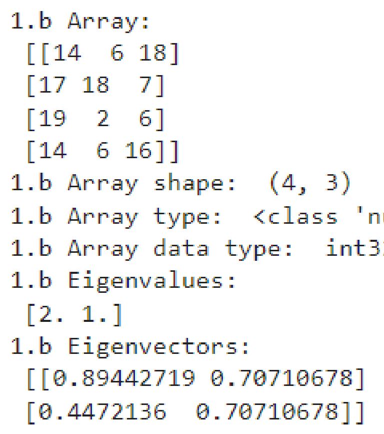
[[3 -2]

[1 0]]

Code :-

```python
import numpy as npy;

# 1.b compute the eigenvalues and right eigenvectors of a given square array
array = npy.random.randint(1, 20, (4, 3), dtype=npy.int32)
print ("1.b Array: \n", array)
print ("1.b Array shape: ", array.shape)
print ("1.b Array type: ", type(array))
print ("1.b Array data type: ", array.dtype)

newArray = npy.array([[3, -2], [1, 0]])
eigenvalues, eigenvectors = npy.linalg.eig(newArray)
print ("1.b Eigenvalues: \n", eigenvalues)
print ("1.b Eigenvectors: \n", eigenvectors)
```

Output :-



```
1.b Array:
 [[14  6 18]
 [17 18  7]
 [19  2  6]
 [14  6 16]]
1.b Array shape:  (4, 3)
1.b Array type:  <class 'numpy.ndarray'>
1.b Array data type:  int32
1.b Eigenvalues:
 [2. 1.]
1.b Eigenvectors:
 [[0.89442719 0.70710678]
 [0.4472136  0.70710678]]
```

Question c

c. Compute the sum of the diagonal element of a given array.

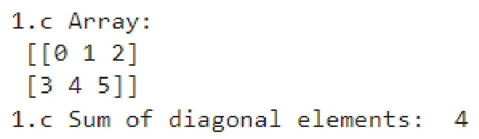
[[0 1 2]

[3 4 5]]

Code :-

```python
import numpy as npy;

# 1.c sum of the diagonal element of a given array:
oneC = npy.array([[0, 1, 2], [3, 4, 5]])
print ("1.c Array: \n", oneC)
print ("1.c Sum of diagonal elements: ", npy.trace(oneC))
```

Output :-



```
1.c Array:
 [[0 1 2]
 [3 4 5]]
1.c Sum of diagonal elements:  4
```

Question d

d. Write a NumPy program to create a new shape to an array without changing its data.
Reshape 3x2:

[[1 2]

[3 4]

[5 6]]

Reshape 2x3:

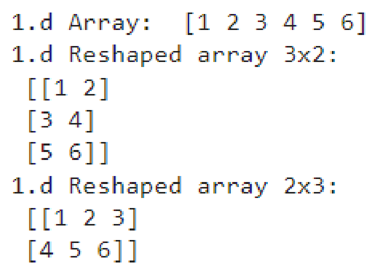
[[1 2 3]

[4 5 6]]

Code :-

```
import numpy as npy;
# 1.d new shape to an array without changing its data. Reshape 3x2:
oneD = npy.arange(1, 7)
print ("1.d Array: ", oneD)
# reshape to 3x2
oneD = oneD.reshape(3, 2)
print ("1.d Reshaped array 3x2: \n", oneD)
# reshape to 2x3
oneD = oneD.reshape(2, 3)
print ("1.d Reshaped array 2x3: \n", oneD)
```

Output :-



```
1.d Array:  [1 2 3 4 5 6]
1.d Reshaped array 3x2:
 [[1 2]
 [3 4]
 [5 6]]
1.d Reshaped array 2x3:
 [[1 2 3]
 [4 5 6]]
```