Python based

Q1. Write a NumPy program to convert an array of integer data type to float data type.

Answer:

```
import numpy as np
a = [1, 2, 3, 4]
print("Original array")
print(a)
x = np.asfarray(a)
print("Array converted to a float type:")
print(x)
```

Q2. Create an array of evenly-spaced values from 10 to 30 with difference 3 with the help one of the functions in numpy package as follows: [10. 13. 16. 19. 22. 25. 28.]

Answer:

```
import numpy as np
np.arange(start=10, stop=30.1, step=3)
```

Q3. There are 3 numpy array functions to create diagonal matrix such as eye( ), identity( ) and np.diag( ). Use one of the functions to display the matrix as follows. [[0. 0. 1. 0. 0.] [0. 0. 0. 1. 0.] [0. 0. 0. 0. 1.] [0. 0. 0. 0. 0.] [0. 0. 0. 0. 0.]]

Answer:

```
import numpy as np
a=np.diag([0.,0.,0.,0.,0.])
a[0,2]=1.
a[1,3]=1.
a[2,4]=1.
a
```

Q4. Write a NumPy program to create an array of 10 zeros, 10 ones, 10 fives with the help of zeros() and ones() function as follows. [0. 0. 0. 0. 0. 0. 0. 0. 0. 0.] [1 1 1 1 1 1 1 1 1 1] [5. 5. 5. 5. 5. 5. 5. 5. 5. 5.]

Answer:

```
import numpy as np
array=np.zeros(10)
print("An array of 10 zeros:")
print(array)
array=np.ones(10)
print("An array of 10 ones:")
print(array)
array=np.ones(10)*5
print("An array of 10 fives:")
print(array)
```

Q5. Write a NumPy program to create a 5x5 zero matrix with elements on the main diagonal equal to 1, 2, 3, 4, 5

Answer:

```
import numpy as np
x = np.diag([1, 2, 3, 4, 5])
print(x)
```

Q6. i) Create a following array and use negative indexing to print the first last, middle and last element of an array.

ii) Also, use the positive indexing to print the first last, middle and last element of an array. [10,20,24,56,32,30,28,78,43,57]

Answer:

i)

```
a=[10,20,24,56,32,30,28,78,43,57]
x=a[-1]
print("first element from last" , x)
z=a[int(-len(a)/2)]
print("middle element from last" , z)
y=a[-len(a)]
print("last element from last" , y)
```

Answer:

ii)

```
a=[10,20,24,56,32,30,28,78,43,57]

x=a[0]

print("first element" , x)

z=a[int(len(a)/2)]

print("middle element" , z)

y=a[len(a)-1]

print("last element" , y)
```

Q7. Create a following array with the help of numpy array() function. [[1.+0.j 2.+0.j 3.+0.j] [4.+0.j 5.+0.j 6.+0.j] [7.+0.j 8.+0.j 9.+0.j]]

Answer:

```
import numpy as np

x =  np.arange(1, 10,dtype=complex).reshape(3,3)

print(x)
```

Q8. Create the following array using array function [[1,2,3], [4,5,6], [7,8,9]]

Answer:

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

y
```

Q9. Print the dtype, shape and strides of the above array and what do you mean by strides?

Answer:

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

x=y.dtype

print("dtype is" , x)

t=y.shape

print("shape is" , t)

z=y.strides

print("stride is" , z)
```

The strides of an array tell us how many bytes we have to skip in memory to move to the next position along a certain axis. For example, we have to skip 4 bytes (1 value) to move to the next column, but 20 bytes (5 values) to get to the same position in the next row.So to go from a[0, 0] -> a[0, 1] (moving horizontally along the 0th row, from the 0th column to the 1st column) the byte-step in the data buffer is 4.

Same for a[0, 1] -> a[0, 2], a[1, 0] -> a[1, 1] etc. This means that the number of strides for the horizontal direction (axis-1) is 4 bytes.However, to go from a[0, 0] -> a[1, 0] (moving vertically along the 0th column, from the 0th row to the 1st row), you need first to traverse all the remaining items on the 0th row to get to the 1st row, and then move through the 1st row to get to the item a[1, 0], i.e. a[0, 0] -> a[0, 1] -> a[0, 2] -> a[1, 0].

Therefore the number of strides for the vertical direction (axis-0) is 3*4 = 12 bytes. Note that going from a[0, 2] -> a[1, 0], and in general from the last item of the i-th row to the first item of the (i+1)-th row, is also 4 bytes because the array a is stored in the row-major order.

Q10. Print memory address of the first byte in the above array.

Answer:

```
import numpy as np

y = np.array([[1, 2, 3],[4, 5, 6],[7,8,9]])

y.data
```

Q11. Write a Python program to print the following string in a specific format: Foundations for Data Analytics VIT AP University

Answer:

```
print("Foundations for Data Analytics \nVIT AP University")
```