1a. How many columns and how many rows are created in the array with the command np.zeros(4,6)?

[In] from math import \*

from numpy import \*

zeros((4,6))

[Out] array([[0., 0., 0., 0., 0., 0.],

[0., 0., 0., 0., 0., 0.],

[0., 0., 0., 0., 0., 0.],

[0., 0., 0., 0., 0., 0.]])

Four rows and six columns.

1b. Name 4 ways to create an array with 2 columns and 3 rows. Bonus point if you can come up with a fifth way.

1. Use zeros
2. Use empty
3. Use ones
4. Use ndarray
5. Use arange and shape

Code for all five below:

one = zeros((3,2))

print(one)

two = empty((3,2))

print(two)

three = ones((3,2))

print(three)

four = ndarray((3,2))

print(four)

five = arange(6)

five.shape = (3,2)

print (five)

1c. Name 3 ways to automatically create an array/list containing the following numbers (Without hard-coding the numbers): [0,2,4,6,8,10,12].

1. Use arange, with bounds of 0 and 14 and an interval of two
2. Use linspace, with bounds of 0 to 12 and 7 points
3. Use list(range) with bounds of 0 to 14 and an interval of two

Code for all 3 below:

one = arange(0,14,2)

print(one)

two = linspace(0,12,7)

print (two)

three = list(range(0,14,2))

print (three)

1d. How do I convert the following array to an array with 4 rows and 2 columns?

tmp1 = np.array([0,2,4,6,8,10,12,14,16])

Use reshape:

[In] tmp1 = array([0,2,4,6,8,10,12,14])

tmp1.reshape(4,2)

[Out] array([[ 0, 2],

[ 4, 6],

[ 8, 10],

[12, 14]])

2a. How does the dtype differ from the standard python integers and floats in terms of memory management and precision?

Dtypes have a constant size in python’s memory, and they are more precise than standard integers and floats.

2b. What is the default dtype in an array of mixed types?

The least precise element.

3a. How would you return a slice of the array tmp1 from Question 1d that goes from 0 to 6 counting by 4s (in numerical value, not index) and save it to a variable named tmp2?

tmp1 = array([0,2,4,6,8,10,12,14,16])

tmp2 = tmp1[0::2]

print(tmp2)

3b. Now if I set tmp2[1] = 0, what does tmp1 look like given the method chosen for part a?

tmp2[1]=0

print(tmp1)

[ 0 2 0 6 8 10 12 14 16]

4a. In your own words, what are structured arrays?

Structured arrays provide storage for compound, heterogenous data. For instance, if you have multiple categories of data on people (e.g. full name, pay grade, age), you could use 3 separate arrays, but that would be inefficient and clunky. Instead, we could use a structured array to store all of it together.

4b. Create a structured array to store 2 HW assignments, 3 preflights and one object for 5 people. Write code to access the 2nd preflight for someone by their name.

table = dtype([('Chapman', [('HW' , int,2), ('PF' , int,3), ('Project' , int,1)]),

('Drake', [('HW' , int,2), ('PF' , int,3), ('Project' , int,1)]),

('Freeman', [('HW' , int,2), ('PF' , int,3), ('Project' , int,1)]),

('Owens', [('HW' , int,2), ('PF' , int,3), ('Project' , int,1)]),

('Mihal', [('HW' , int,2), ('PF' , int,3), ('Project' , int,1)])])

print(table['Chapman']['PF'])

5. Name two ways to add the following arrays together using built-in methods or functions:

X = np.array([1,2]) y = np.array([3,4])

x = array([2,2])

y = array([3,3])

first = (x+y)

print (first)

second = add(x,y)

print(second)

What are some advantages/limitations of each approach used?

The first method is simple and does not require importing any libraries. The second makes the code much more explicit for someone else reading the code, and does not risk confusing yourself that what you input was a function. For more complicated equations, of course, there is greater risk for error in the first way. Both require integers or floats.

6. In your own words what are Python ufuncs?

Universal functions are “vectorized” wrappers, in that they take a fixed number of inputs for a function and produce a fixed number of specific outputs. Some work on scalars, others on sub-arrays and other dimensions.

7a. What is one concept that you found difficult in the reading?

Integrating ufuncs was confusing until I did some more research online about them.

7b. What about the class structure works for you?

I like the preflights keeping me on track, although the preflights seem much more basic than what we are expected to do in class and the HW.

7c. What about the class structure does not work for you?

Occasionally when I make an error while trying to follow along code in class, it is impossible for me to fix my code in sufficient time to catch up and see what you are doing down the line; often there is a gap where something crucial was input while I was trying to fix my code that I did not see, and everything afterwards is lost as I can’t follow along.

7d. What is something we should be doing in class but aren’t?

Time is at a premium; perhaps working in groups to code a particular problem to get a greater degree of participation and shared understanding.

COLLABORATION: CPT Chapman and CPT Drake helped me out quite a bit with this homework. While the basic arrays were not too difficult, CPT Chapman did show me the fifth method for problem 1b, and they both explained 4b to me and made the syntax make more sense to me.