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## ▼ HW8: Arrays and Loops

### ▼ Problem 1

Import Numpy

a) Create an array of 50 ones called  $x$ .

b) Create an array from 1-20 with 50 equally-spaced elements two different ways (using a loop and a single command). Call the two arrays  $y$  and  $z$ .

c) Subtract  $y$  from  $z$  and report the sum of the absolute difference of each element to show that they are the same.

### ▼ Problem 2

import the python package "random"

a) Create a matrix,  $M$ , as a 1x1 numpy array of value 1

b) Using a while loop, append a random integer between 1 and 10 to the end of matrix  $M$  until the last element is a 7.

c) Report the number of elements in  $M$  and the mean value of the elements after the loop.

d) Also, because a while loop is easily susceptible to infinite loops, create a variable  $i$  to keep track of how many times you have gone through the while loop. If  $i$  exceeds 30, immediately exit the while loop. Don't report the matrix size using  $i$ .

You may need to search online (e.g. Google) how to create a random integer using the random package and how to append elements to a numpy array.

### ▼ Problem 3

Using the following array,  $a$ :

Reshape the array to a 5x5 matrix (using a numpy command)

Loop through each element of the array. If the element value is 5 or 8, print the element index. Also, keep track of how many 5s and 8s there are with variable  $k$ . Print  $k$ . If the element value is a 1, print "You win!"

```
a = np.array([ 8., 3., 10., 8., 2., 2., 10., 10., 5., 10., 2., 10., 9., 10., 9., 4., 2., 8., 7., 4., 1., 4., 5., 6.
```

### ▼ Problem 4

For the following arrays (matrices and vectors):

$$A = \begin{bmatrix} 1.1 & 2.5 & 3.2 \\ 4.8 & 5.0 & 6.1 \\ 7.3 & 8.9 & 9.1 \end{bmatrix}$$

$$x = \begin{bmatrix} 1 \\ 3 \\ 4 \end{bmatrix}$$

$$B = \begin{bmatrix} -0.1 & -0.2 & -0.3 \\ 3 & 10 & 2 \\ 4 & 2 & 0.5 \end{bmatrix}$$

Perform the following operations:

a)  $A \circ B$  (element-wise multiplication)

b)  $A \bullet B$  (dot product multiplication)

c)  $A \times B$  (cross product multiplication)

d)  $A \bullet x$

e)  $A^{-1} \bullet B$