1. Include a section with your name

```
In [1]: print('My name is Zhicheng (Jason) Xue')

        My name is Zhicheng (Jason) Xue
```

Import Numpy package

```
In [2]: import numpy as np
```

2. Create matrix A with size (3,5) containing random numbers A = np.random.random(15)

```
In [3]: A=np.matrix(np.random.random(15))
```

```
In [4]: A=A.reshape(3,5)
```

```
In [5]: A

Out[5]: matrix([[0.33324911, 0.63600693, 0.89205563, 0.3276894 , 0.90723115],
                [0.56223462, 0.17652161, 0.26115557, 0.16863686, 0.57658794],
                [0.44767836, 0.89999754, 0.62172655, 0.92264188, 0.09581348]])
```

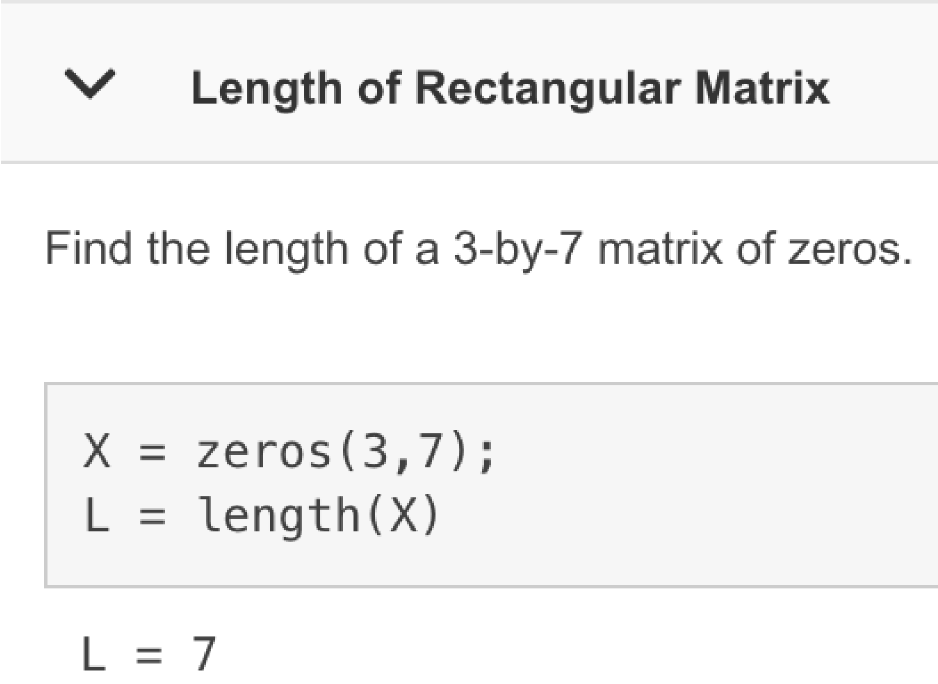
3. Find the size and length of matrix A

```
In [6]: A.size #size of matrix A

Out[6]: 15
```

```
In [7]: len(A) #length of matrix A using len() function in Python which returns number of r
        ows in a matrix

Out[7]: 3
```

Comment: I looked up definition of length of matrix in Matlab (https://www.mathworks.com/help/matlab/ref/length.html (https://www.mathworks.com/help/matlab/ref/length.html))

length of a matrix should be length of largest array dimension so I also tried below



Length of Rectangular Matrix

Find the length of a 3-by-7 matrix of zeros.

```
X = zeros(3,7);
L = length(X)
```

```
L = 7
```

```
In [8]: np.max(A.shape)
Out[8]: 5
```

4. Resize (crop/slice) matrix A to size (3,4)

```
In [9]: A=A[:,:4]
```

```
In [10]: A
Out[10]: matrix([[0.33324911, 0.63600693, 0.89205563, 0.3276894 ],
                 [0.56223462, 0.17652161, 0.26115557, 0.16863686],
                 [0.44767836, 0.89999754, 0.62172655, 0.92264188]])
```

5. Find the transpose of matrix A and assign it to B

```
In [11]: B=A.T
```

```
In [12]: B
Out[12]: matrix([[0.33324911, 0.56223462, 0.44767836],
                 [0.63600693, 0.17652161, 0.89999754],
                 [0.89205563, 0.26115557, 0.62172655],
                 [0.3276894 , 0.16863686, 0.92264188]])
```

6. Find the minimum value in column 1 of matrix B (check the properties of a matrix – ‘B.min()’)

```
In [13]: B.min(0)[0,0]

Out[13]: 0.3276894048605279
```

7. Find the minimum and maximum values for the entire matrix A

minimum of A

```
In [14]: A.min()

Out[14]: 0.16863685839143994
```

maximum of A

```
In [15]: A.max()

Out[15]: 0.9226418778632012
```

8. Create vector X (an array) with 4 random numbers

```
In [16]: X=np.array(np.random.random(4))
```

```
In [17]: X

Out[17]: array([0.07369468, 0.25838168, 0.60192939, 0.1780503 ])
```

```
In [18]: X.shape

Out[18]: (4,)
```

```
In [19]: A.shape

Out[19]: (3, 4)
```

9. Create a function and pass vector X and matrix A in it

```
In [23]: def matmul_new1(X,A):
             D1=A.dot(X)
             return D1
```

```
In [20]: def matmul_new(X,A):
             D=np.matmul(A,X)
             return D
```

10. In the new function multiply vector X with matrix A and assign the result to D

(note: you may get an error! ... think why and fix it. Recall matric manipulation in class!)

```
In [21]: D=matmul_new(X,A)
```

```
In [22]: D
```

```
Out[22]: matrix([[0.78419093, 0.27426671, 0.80404654]])
```

```
In [24]: D1=matmul_new1(X,A)
```

```
In [25]: D1
```

```
Out[25]: matrix([[0.78419093, 0.27426671, 0.80404654]])
```

Notice that dot and matmul returned the same result in this case

11. Create a complex number Z with absolute and real parts != 0

```
In [26]: Z=3+4j
```

```
In [27]: type(Z)
```

```
Out[27]: complex
```

12. Show its real and imaginary parts as well as it’s absolute value

real part

```
In [28]: Z.real
```

```
Out[28]: 3.0
```

imaginary part

```
In [29]: Z.imag
```

```
Out[29]: 4.0
```

absolute part

```
In [30]: np.absolute(Z)
```

```
Out[30]: 5.0
```

13. Multiply result D with the absolute value of Z and record it to C

```
In [31]: D.shape

Out[31]: (1, 3)
```

```
In [32]: C=D*np.absolute(Z)
```

```
In [33]: C

Out[33]: matrix([[3.92095464, 1.37133355, 4.02023269]])
```

14. Convert matrix B from a matrix to a string and overwrite B

```
In [34]: B

Out[34]: matrix([[0.33324911, 0.56223462, 0.44767836],
                 [0.63600693, 0.17652161, 0.89999754],
                 [0.89205563, 0.26115557, 0.62172655],
                 [0.3276894 , 0.16863686, 0.92264188]])
```

```
In [35]: B=np.array_str(B)
```

```
In [36]: B

Out[36]: '[[0.33324911 0.56223462 0.44767836]\n [0.63600693 0.17652161 0.89999754]\n [0.892
         05563 0.26115557 0.62172655]\n [0.3276894  0.16863686 0.92264188]]'
```

15. Display a text on the screen: ‘Your Name is done with HW2‘

```
In [37]: print('Zhicheng Xue is done with HW2')

         Zhicheng Xue is done with HW2
```

16. Organize your code: use each line from this assignment as a comment line before each step

17. Save all steps as a script in a .py file

18. Email your Github link to me including your .py file + screenshots of your running code no later than midnight on Saturday Jun.09.