**Assignment 1.**

For all questions, try to avoid the use of loops. Use vectorized operations and broadcasting as much as possible.

1[2]. Use NumPy to create a 10x10 array that contains the multiplication table. Here is what the values inside the array should look like. Show the code to create the array. Use the outer function to create the array.

1 2 3 4 5 6 7 8 9 10  
2 4 6 8 10 12 14 16 18 20  
....  
10 20 30 40 50 60 70 80 90 100

2[2]. Write code that selects the 4x4 array that is in the middle inside the big array. Result should be:

[[16, 20, 24, 28],

[20, 25, 30, 35],

[24, 30, 36, 42],

[28, 35, 42, 49]]

3[2]. Create a 4x4 array that contains the numbers from 1 to 16. Use the arange and reshape functions. The result should be.

1 2 3 4

5 6 7 8

9 10 11 122

1. 4 15 16

4[2]. Consider the arrays from the last two questions. Create a new 4x4 array that has value of **true** if both values in the two arrays are even and false otherwise. Hint: use a vectorized custom function with two inputs.

5[2]. Write code that returns the number of even numbers in the array from Q2.

6[2]. Write code the returns the square root of the numbers in the array from Q3.

7[2]. Write code that returns the array from Q1, where the numbers on the diagonal are incremented by 1. Do not explicitly enumerate all the elements on the diagonal.

8[2]. Write code that shows the array from Q1 in reverse order. The first row should have the number 100, 90,...10. The second row should be the ninth row in the initial array in reverse order and so on.

9[2]. Write code that creates a 10x10 array of random float numbers between 0.0 and 10.0. The numbers should appear in the array sorted in ascending order.

10[2]. Write code that creates one-dimensional array of 10 elements. The ith element should be the average of the numbers in the ith row of the array from Q1.

11[4]. Write a method that performs merge sort. Use partition, split, recursion, and the hstack method.