Arrays

# Before Class

1. Familiarize yourself with an array data structure. Explain the terms: element and index.
2. Find out what a list is in python. What is the difference between a list and an array.

<https://www.javatpoint.com/python-array-vs-list>

Note that in subsequent tasks in this topic, a list will be used in place of an array for basic applications.

1. Watch the video on using lists in Python:

<https://youtube.com/playlist?list=PLi01XoE8jYohWFPpC17Z-wWhPOSuh8Er->

# During Class

1. Declare an array with values "Peter", "Ann", and "Paula". In interactive mode, display:
   1. The number of names in the array
   2. First name
   3. Last name (by calculating the number of array elements)
2. Declare an array with integer values 2, 3, 7, 5. In interactive mode, display:
   1. number of elements in the array
   2. second number in the array
   3. last but one number
   4. sum of the first and last number
3. An array contains numbers: 15, 8, 31, 47, 2, 19. Create a program that calculates and displays the arithmetic mean of array numbers.
4. An array contains integer numbers. Create a program that calculates and displays the number of even and odd numbers in an array.
5. An array contains numbers: -15, 8, -31, 47, -2, 19. Create a program that finds and displays the maximum and minimum number.
6. Create a program that displays the name of month for a given month number (1 to 12). Define a month(n) function that returns the name of month for the number n. Put month names in an array.
7. Define a function sum(array) that returns the sum of all numbers contained in an array. Also define a function array2str(array) that returns all elements of the array as a single string. Then create a program that displays array elements and their sum. Sample result:

Array: 4 3 7 1 3  
Sum of values: 18

1. Define a function compare(array1, array2) that returns True if both arrays are the same. Arrays are the same if they have the same number of elements and values of elements in cells of arrays with the same index are equal. Then create a program and try to compare the following arrays:
   1. ["water","book","sky"] ["water","book","sky"]
   2. [True,False] [True,False,True]
   3. [5,3,1] [5,3,1]
   4. [3,2,1] [3,2]

Display both arrays and the result of comparison. Sample result:

Array1: water book sky  
Array2: water book sky  
Comparison: arrays are the same

# After Class

1. An array contains natural numbers: 15, 8, 31, 47, 2, 19. Create a program that displays the contents of the array in reverse order. Use any loop statement. Sample result:

existed array: 15 8 31 47 2 19   
reverse array: 19 2 47 31 8 15

1. Create a program that computes the second power of each array element. Sample result:

Array: 8 2 5 1 9  
2nd power: 64 4 25 1 81

1. An array contains a list of Polish names: Genowefa, Onufry, Celestyna, Alojzy, Pankracy. Create a program that displays the longest name (consisting of the largest number of characters). Sample result:

Names: Genowefa Onufry Celestyna Alojzy Pankracy  
Longest name: Celestyna

1. An array contains color names. Create a program that writes the contents of an array to a text file. Put each color on a separate line.
2. An array contains integer numbers: 12, 6, 4, 9 and 3. Create a program that displays the array values graphically as below. Define a function star(n) that returns the given number of asterisks as a string. Use a defined function in the program.

12: \*\*\*\*\*\*\*\*\*\*\*\*  
 6: \*\*\*\*\*\*  
 4: \*\*\*\*  
 9: \*\*\*\*\*\*\*\*\*  
10: \*\*\*\*\*\*\*\*\*\*

1. Two arrays contain the following integer numbers [4,36,12,28,9,44,5] and [5,1,36]. Create a program that displays the numbers from the first array that do not appear in the second array.
2. Create a program that sorts elements of an array containing integer numbers. Apply the Bubble Sort sorting algorithm. Define a function bubblesort(array) that returns the sorted array. Try to sort and display any three arrays.
3. Create a program that displays all unique elements in an array. Sample result:

Array: 2 3 2 5 8 1 9 8  
Unique elements: 3 5 1 9

1. Define a function occurs(number, array) that returns True if a given number is present in an array. Then create a program that checks whether the number entered from the keyboard is present in the array [15, 38, 7, 23, 14]. Sample result:

Number: 23  
Array: 15 38 7 23 14  
Result: number 23 appears in the array

1. Write a program to find the second largest element in an array. Sample result:

Array: [5,1,9,6,1]  
Result: 6

1. Write a program that displays the difference between the largest and smallest values in an array of integers. Sample result:

Array: [5,1,9,6,1]  
Result: 8

1. Define a median(array) function that returns the median of the given array of numbers. The median is the middle value in the ordered sequence of numbers (<https://en.wikipedia.org/wiki/Median#/media/File:Finding_the_median.png>). Then, using the defined function, calculate and display the median for the following values:
   1. [1,0,9,4,6]
   2. [6,8,3,1,0,5,7]
2. Write a program that, for the given array of real numbers, displays the number of elements that are greater than the given value entered from the keyboard.
3. Create a function minmax(array) that, for the given array of integers, returns a two-element array containing the smallest and largest values in the given array. Sample result:

Array: [4,2,8,4,7,9,5]  
Result: [2,9]

1. Write a program to separate even and odd numbers of a given array of integers. Put all even numbers first, and then odd numbers.
2. Define a function that returns the elements of the array as a string, separated by commas. Using defined functions, display the contents of any array. Sample result:

Array: [5,4,3,2,6,5]  
String: 5,4,3,2,6,5

1. The array contains integer numbers from 1 to 999. Write a program that displays elements of the array formatted as below.

-----------------------------------------  
| 1| 23| 5| 382| 1| 17| 4| 906|  
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1. Write a program that checks whether the first array is a subset of the second one (whether all elements of the first array appear in the second array).
2. Define a function rand\_elem(array) that returns a randomly selected array element. Using the function, display a few randomly selected array elements.