**PRACTICA INDIVIDUAL DE PYTHON. NO. 2**

**Nota: Realizar la cantidad en paréntesis por cada categoría de problema**

**PART I: STRINGS, TUPLES, AND LISTS (12)**

1. Write a Python program to count the number of characters (character frequency) in a string. Sample String : google.com'. Expected Result : {'g': 2, 'o': 3, 'l': 1, 'e': 1, '.': 1, 'c': 1, 'm': 1}
2. Write a Python function to get a string made of the first 2 and the last 2 chars from a given a string. If the string length is less than 2, return instead of the empty string. Sample String : 'w3resource'. Expected Result : 'w3ce'. Sample String : 'w3'; Expected Result : 'w3w3'. Sample String : ' w'. Expected Result : Empty String
3. Write a Python program to get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself. Sample String : 'restart'. Expected Result : 'resta$t'
4. Write a Python program to get a single string from two given strings, separated by a space and swap the first two characters of each string. Sample String : 'abc', 'xyz'. Expected Result : 'xyc abz'.
5. Write a Python function convert a given string list to a tuple.
6. Write a Python program to calculate the average value of the numbers in a given tuple of tuples.

Original Tuple: ((10, 10, 10, 12), (30, 45, 56, 45), (81, 80, 39, 32), (1, 2, 3, 4)). Average value of the numbers of the said tuple of tuples: [30.5, 34.25, 27.0, 23.25]. Original Tuple: ((1, 1, -5), (30, -15, 56), (81, -60, -39), (-10, 2, 3))Average value of the numbers of the said tuple of tuples: [25.5, -18.0, 3.75].

1. Convert the tuples to lists and in the point 6 and calculate the average.
2. Write a Python function to convert a tuple of string values to a tuple of integer values. Original tuple values: (('333', '33'), ('1416', '55')); New tuple values: ((333, 33), (1416, 55))
3. Write a Python program to get the smallest number from a list.
4. 5. Write a Python program to count the number of strings where the string length is 2 or more and the first and last character are same from a given list of strings.

Sample List : ['abc', 'xyz', 'aba', '1221']

1. Write a Python program to get a list, sorted in increasing order by the last element in each tuple from a given list of non-empty tuples

Sample List : [(2, 5), (1, 2), (4, 4), (2, 3), (2, 1)]

1. Expected Result : [(2, 1), (1, 2), (2, 3), (4, 4), (2, 5)]
2. Write a Python program to remove duplicates from a list.
3. Write a Python program to check a list is empty or not. Go to the editor
4. Write a Python program to clone or copy a list.
5. Write a Python function to find the list of words that are longer than n from a given list of words
6. Write a Python function that takes two lists and returns True if they have at least one common member.
7. Write a Python program to print a specified list after removing the 0th, 4th and 5th elements. Sample List : ['Red', 'Green', 'White', 'Black', 'Pink', 'Yellow']

Expected Output : ['Green', 'White', 'Black']

1. Write a Python program to change the position of every n-th value with the (n+1)th in a list. Sample list: [0,1,2,3,4,5]
2. Expected Output: [1, 0, 3, 2, 5, 4]
3. Write a Python program to convert a list of multiple integers into a single integer. Sample list: [11, 33, 50]

Expected Output: 113350

1. Write a Python program to remove the K'th element from a given list, print the new list. Original list: [1, 1, 2, 3, 4, 4, 5, 1]. After removing an element at the kth position of the said list: [1, 1, 3, 4, 4, 5, 1]
2. Write a Python program to insert an element at a specified position into a given list. Original list: [1, 1, 2, 3, 4, 4, 5, 1]. After inserting an element at kth position in the said list: [1, 1, 12, 2, 3, 4, 4, 5, 1]
3. Write a Python program to extract a given number of randomly selected elements from a given list. Original list: [1, 1, 2, 3, 4, 4, 5, 1]. Selected 3 random numbers of the above list: [4, 4, 1]

**PART II; SETS AND DICTIONARIES (10)**

1. Write a Python program to remove an item from a set if it is present in the set
2. Write a Python program to create an intersection of sets.
3. Write a Python program to create a union of sets.
4. Write a Python program to create set difference
5. Write a Python program to find maximum and the minimum value in a set.
6. Write a Python program to find the length of a set.
7. Write a Python program to check if a given value is present in a set or not.
8. Write a Python program to check if two given sets have no elements in common
9. Write a Python program to check if a given set is superset of itself and superset of another given set.
10. Write a Python program to find the elements in a given set that are not in another set
11. Write a Python script to generate and print a dictionary that contains a number (between 1 and n) in the form (x, x\*x). Sample Dictionary ( n = 5) : Expected Output : {1: 1, 2: 4, 3: 9, 4: 16, 5: 25}
12. Write a Python script to generate and print a dictionary where the keys are numbers between 1 and 15 (both included) and the values are square of keys. Sample Dictionary: {1: 1, 2: 4, 3: 9, 4: 16, 5: 25, 6: 36, 7: 49, 8: 64, 9: 81, 10: 100, 11: 121, 12: 144, 13: 169, 14: 196, 15: 225}
13. Write a Python script to merge two Python dictionaries.
14. Write a Python program to create and iterate over dictionaries using for loops, to sum all the items in a dictionary.
15. Write a Python program to combine two dictionary adding values for common keys. d1 = {'a': 100, 'b': 200, 'c':300}; d2 = {'a': 300, 'b': 200, 'd':400}. Sample output: Counter({'a': 400, 'b': 400, 'd': 400, 'c': 300})
16. Write a Python fucntion to print all unique values in a dictionary. Sample Data : [{"V":"S001"}, {"V": "S002"}, {"VI": "S001"}, {"VI": "S005"}, {"VII":"S005"}, {"V":"S009"},{"VIII":"S007"}]. Expected Output : Unique Values: {'S005', 'S002', 'S007', 'S001', 'S009'}.

**PART III: RECURSION (3)**

1. Write a Python program to solve the Fibonacci sequence using recursion.
2. Write a Python program to solve FACTORIAL sequence FROM N as non-negative integer using recursion
3. Write a Python program to get the sum of a non-negative integer .

**PART IV: NUMPY LIBRARY-MATRICES (8)**

1. 1. Write a NumPy program to compute the multiplication of two given matrixes.
2. 2. Write a NumPy program to compute the outer product of two given vectors.
3. 3. Write a NumPy program to compute the cross product of two given vectors.
4. 4. Write a NumPy program to compute the determinant of a given square MATRIX.
5. 5. Write a NumPy program to evaluate Einstein's summation convention of two given multidimensional arrays.
6. 6. Write a NumPy program to compute the inner product of vectors for 1-D arrays (without complex conjugation) and in higher dimension.
7. 7. Write a NumPy program to compute the eigenvalues and right eigenvectors of a given square MATRIX.
8. 8. Write a NumPy program to compute the Kronecker product of two given mulitdimension arrays.
9. 9. Write a NumPy program to compute the condition number of a given matrix.
10. 10. Write a NumPy program to find a matrix or vector norm.
11. 11. Write a NumPy program to compute the determinant of an MATRIX.
12. 12. Write a NumPy program to compute the inverse of a given matrix.
13. 13. Write a NumPy program to calculate the QR decomposition of a given matrix.
14. 14. Write a NumPy program to compute the condition number of a given matrix.
15. 15. Write a NumPy program to compute the sum of the diagonal element of a given array.
16. 17. Write a NumPy program to get the qr factorization of a given array. Go to the editor
17. 18. Write a NumPy program to compute the factor of a given array by Singular Value Decomposition.

**PART IV: NUMPY LIBRARY-STATISTICS (6)**

1. 1. Write a Python program to find the maximum and minimum value of a given flattened array.   
   Expected Output:  
   Original flattened array:  
   [[0 1]  
   [2 3]]  
   Maximum value of the above flattened array:3  
   Minimum value of the above flattened array: 0
2. 2. Write a NumPy program to get the minimum and maximum value of a given array along the second axis.    
   Expected Output:  
   Original array:  
   [[0 1]  
   [2 3]]  
   Maximum value along the second axis:  
   [1 3]  
   Minimum value along the second axis:  
   [0 2]
3. 3. Write a NumPy program to calculate the difference between the maximum and the minimum values of a given array along the second axis.    
   Expected Output:  
   Original array:  
   [[ 0 1 2 3 4 5]  
   [ 6 7 8 9 10 11]]  
   Difference between the maximum and the minimum values of the said array:  
   [5 5]
4. 4. Write a NumPy program to compute the 80th percentile for all elements in a given array along the second axis.  Expected Output:  
   Original array:  
   [1.0, 2.0, 3.0, 4.0]  
   Largest integer smaller or equal to the division of the inputs:  
   [ 0. 1. 2. 2.]
5. 5. Write a NumPy program to compute the median of flattened given array.  Note: First array elements raised to powers from second array  
   Expected Output:  
   Original array:  
   [[ 0 1 2 3 4 5]  
   [ 6 7 8 9 10 11]]  
   Median of said array:  
   5.5
6. 6. Write a NumPy program to compute the weighted of a given array.  Sample Output:  
   Original array:  
   [0 1 2 3 4]  
   Weighted average of the said array:  
   2.6666666666666665
7. 7. Write a NumPy program to compute the mean, standard deviation, and variance of a given array along the second axis.  Sample output:  
   Original array:  
   [0 1 2 3 4 5]  
   Mean: 2.5  
   std: 1  
   variance: 2.9166666666666665
8. 8. Write a NumPy program to compute the covariance matrix of two given arrays.  Sample Output:  
   Original array1:  
   [0 1 2]  
   Original array1:  
   [2 1 0]  
   Covariance matrix of the said arrays:  
   [[ 1. -1.]  
   [-1. 1.]]
9. 9. Write a NumPy program to compute cross-correlation of two given arrays.  Original array1:  
   [0 1 3]  
   Original array1:  
   [2 4 5]  
   Cross-correlation of the said arrays:  
   [[2.33333333 2.16666667]  
   [2.16666667 2.33333333]]
10. 10. Write a NumPy program to compute pearson product-moment correlation coefficients of two given arrays   
    Sample Output:  
    Original array1:  
    [0 1 3]  
    Original array1:  
    [2 4 5]  
    Pearson product-moment correlation coefficients of the said arrays:  
    [[1. 0.92857143]  
    [0.92857143 1. ]]
11. 12. Write a Python NumPy program to compute the weighted average along the specified axis of a given flattened array.  Sample output:  
    Original flattened array:  
    [[0 1 2]  
    [3 4 5]  
    [6 7 8]]  
    Weighted average along the specified axis of the above flattened array:  
    [1.2 4.2 7.2]
12. 13. Write a Python program to count number of occurrences of each value in a given array of non-negative integers.